FLIGHT

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

FEBRUARY 4th, 1943

BRITISH

POWER

37'6" CONTROL LAUNCH

LOCKHEED ENGINEERING LIBRARY

THE BRITISH POWER BOAT COMPANY LTD. Constructors of Scott-Paine Surface Craft

THERE IS A TIDE
IN THE AFFAIRS
OF MEN WHICH,
TAKEN AT THE FLOOD,
LEADS ON TO FORTUNE;
Omitted, all the voyage..
of their life is bound in
shallows and in miseries.
ON SUCH A FULL SEA
ARE WE NOW AFLOAT;
And we must take the
current when it serves,
Or lose our ventures.

B. O. MORRIS LTD.

Manufacturers of 'MORRISFLEX' Flexible Shaft Equipment and Accessories, and 'REX' Rotary Files and Cutters.

SHIRLEY, BIRMINGHAM.

Telephone: Shirley 1237. Telegrams: 'Morrisflex,' Birmingham.

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH, M.B.E.

Chief Photographer JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. *Telegrams:* Autocar, Coventry. *Telephone:* Coventry 5210.

BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. *Telegrams:* Autopress, Birmingham. *Telephone:* Midland 2971 (5 lines).

MANCHESTER, 3: 260, DEANSGATE. *Telegrams:* Iliffe, Manchester. *Telephone:* Blackfriars 4412.

GLASGOW, C.2: 26B, RENFIELD ST. *Telegrams:* Iliffe, Glasgow. *Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1780. Vol. XLIII. **February 4th, 1943.** Thursdays, One Shilling.

The Outlook

Fleet Air Arm Equipment

WERE it not for the fact that the subject is serious, one would be tempted to apply to the debate in the House of Lords last week the familiar paraphrasing of a famous soap advertisement that was current many years ago. As applied to the Irish, the paraphrase ran: "They don't know what they want, and they won't be happy till they get it." The debate in the Lords, shorn of all superfluous verbiage, rather indicated that in the matter of air equipment for the Fleet Air Arm the Admiralty does not, or at least did not, know what it wants and will not be happy till it gets it.

Lord Winster put it much more politely.

> "There is," he said, "a controversy between those who say that the Admiralty did not get what they wanted for the Fleet Air Arm and those who say that the Admiralty was not clever at explaining what exactly it was that it wanted."

As Lord Winster pointed out, the Admiralty has, since the decision of the Balfour Committee in 1923, obtained its air equipment from the Air Ministry, but is supposed to put forward suggestions as to the types of aircraft it wants. The formation of the Ministry of Aircraft Production in 1940 did not change that policy except to transfer from the Air Ministry to the M.A.P. the task of supply.

Lord Winster did not go much beyond saying that someone is to blame for the fact that the Fleet Air Arm is to-day, in the fourth year of war, badly equipped. Lord Gifford introduced a note of realism into the debate by pointing out that the debate was a year too late, and that personnel of the Fleet Air Arm now feel that everything possible is being done to give them the best equipment.

Lord Beaverbrook's plea for greater scope for individualism, and his insistence upon the fact that it is the firms and not the Ministries nor the Admiralty that ultimately decide the goodness or otherwise of aircraft types, will meet with full agreement in the aircraft industry. It is no exaggeration to say that every service type which has achieved outstanding success has been either a private venture or has differed so much from the official specification as to be virtually a different aircraft. Lord Beaverbrook got his names a bit mixed up, but his basic argument was sound.

The Admiralty to Blame

LORD TRENCHARD supported Lord Winster in claiming that if the Admiralty had not got the aircraft they wanted, the fault was theirs and not that of the Air Ministry or M.A.P. The Admiralty requirements had been formulated from a sailor's point of view, and the aircraft types which resulted had failed to stand the test of war. We cannot agree with Lord Trenchard that all Naval aviation should be handed to the R.A.F., but we do not think any fair-minded person would deny that the Admiralty has only itself to blame if it now is dissatisfied with its aircraft.

A somewhat debatable point raised by Lord Trenchard referred to torpedo aircraft. He claimed that the Admiralty did not believe in torpedo aircraft, and that the R.A.F. did. Lord Trenchard said:

> "They (the Admiralty) scoffed at torpedo machines, but the Royal Air Force realised the value of them and kept them going all those long years down to 1937."

It might be pointed out that in January, 1937 (before handing over the Fleet Air Arm to the Admiralty), the F.A.A. had 13 squadrons, of which three were T.B. squadrons. That percentage does not look like a disbelief in torpedo aircraft, although we are well aware that there were many Naval officers who thought the torpedo machine would be blown out of the sky long before it could get its torpedo launched.

On the subject of fighters for the Fleet Air Arm, Lord

LOCKHEED ENGINEERING

Winster said the primary need of the Fleet Air Arm had always been a very fast fighter, and yet only recently had it been given the Seafire. Lord Cherwell, in replying for the Government, retorted that this was due to the fact that the Admiralty originally said they wanted two-seater fighters.

Adaptations or New Designs?

ONE interesting problem was raised by a remark made by Lord Trenchard. In explaining that the progress made with Fleet Air Arm types had consisted of modifying existing R.A.F. types, he expressed the view that that process was bound to be slow, and could only result in a compromise. That a modified type must be more or less of a compromise may be accepted. But does it necessarily follow that the process is slow?

One has to go back a number of years for a type designed specially for the Fleet Air Arm. The only type that comes to mind is the Fairey Flycatcher, and we have no records of how long it took to get that machine into service. It could hardly be said to be far ahead of contemporary R.A.F. fighters. It should be remembered that in the "old biplane days" the Fleet Air Arm was not badly served by conversions from R.A.F. types. The Fury single-seater fighter became the Fleet Air Arm Nimrod, and similarly the two-seater Hart became the Osprey. The conversion did not take over long, and the types gave good service. It is probably true that to-day the requirements of the two services tend to diverge more than they did then, but, even so, the Seafire is probably as "advanced" a type as can reasonably be used from existing carriers.

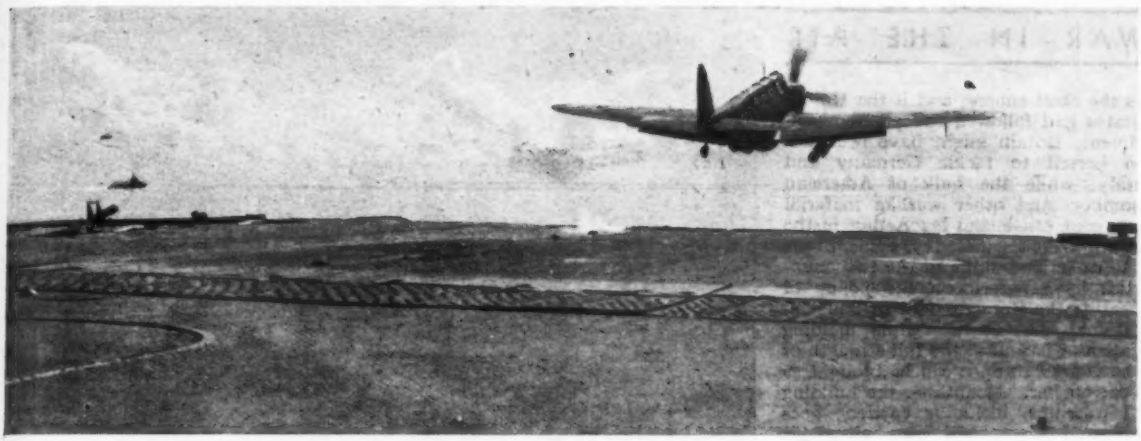
If the debate in the Lords did not afford many useful pointers to improvement in F.A.A. equipment, it did, at any rate, serve to focus attention on a subject which should have been dealt with effectively long ago.

Perhaps the most constructively useful part was the appreciation of the recent reorganisation at the Admiralty resulting in the appointments of Rear-Admirals Boyd and Portal, and the expression of the hope that naval representation at the M.A.P. should be overhauled.

CONTENTS

The Outlook	109
War in the Air	111
Here and There	114
Two Miles Types	115
Fleet Air Arm Debate	119
Aircraft Characteristics	120, a and b
The Air and Shipping	121
Power-operated Gun Turrets	122
Behind the Lines	128
Fighter Station's Veteran C.O.	129
The Sandor Synchrophone	130
Correspondence	131
Service Aviation	133

MEDITERRANEAN MEDITATION: President Roosevelt and Mr. Winston Churchill at Casablanca. Behind them are, left to right: General Marshall, Chief of Staff, U.S. Army; Admiral Sir Dudley Pound; Air Chief Marshal Sir Charles Portal; General Sir Alan Brooke; Field Marshal Sir John Dill and Lord Louis Mountbatten.



OVER THE STEAM JET : A Fairey Fulmar 8-gun fighter taking off from the flight deck of a carrier

WAR in the AIR

The Casablanca Conference : Americans Bomb Germany : Lorient Base Raided Again : Diesel Works at Copenhagen

THE sensational meeting of President Roosevelt and Mr. Churchill at Casablanca is yet one more illustration of how air transport expedites the planning of war. To their meeting should be added the also extremely important meeting of General de Gaulle and General Giraud at the same place and at the same time. But for air transport these conferences could not have taken place in the way they did, for, though Mr. Churchill has twice crossed the Atlantic in a battleship to meet the President, it is not always convenient to send such a vessel to a particular spot. Everyone feels certain that the onslaught of the United Nations on the already tottering Axis will proceed all the better and all the faster as a result of this historic meeting. The resistance of France to the aggressor, and her stature among the United Nations, will both be increased by the meeting of the two patriotic and able French Generals.

The spirits of the German people must have received a severe shock when it was admitted to them that their Sixth Army at Stalingrad had been surrounded and would be exterminated. To add to their depression came the first raid on a German port by bombers of the American Eighth Army Air Force last week. For some months that Air Force has been, so to speak, getting its hand in by raiding places in the occupied countries, and it has made 29 raids of that description. The occupying German forces have realised the significance of those raids, but they cannot have come home to the soldiers and civilians in Germany. The latter have endured many devastating attacks by the R.A.F., but they have probably also heard and rejoiced at the constant complaints that Bomber Command has not enough machines to do all that it would like to do, and that it is being often diverted to other targets, which diversions have given a respite to German production.

This raid on Wilhelmshaven by Fortresses and on other places in the Reich by Liberators must have brought it home to the Germans in Germany that the future before them is indeed grim. American production is now approaching its peak, and the numbers of bombers available is increasing at a rate which bodes ill for Germany as well as Japan.

In this connection, it may be pointed out that the combined planning of Britain and the United States is having an effect which may well have surprised our enemies. American sentiment, quite naturally, regards Japan

ICEBOUND : The wading party bringing a Catalina to an Icelandic slipway.

WAR IN THE AIR

as the chief enemy, and if the United States had followed the popular sentiment, Britain might have been left to herself to tackle Germany and Italy, while the bulk of American bombers and other warlike material was sent to General MacArthur in the South-West Pacific. It is evident that the rulers and staffs of the two countries have agreed on the policy of beating the Germans first to "unconditional surrender," while holding Japan at bay until the full strength of the United Nations can be brought to bear on her. Meantime, the building of warships, including carriers, goes on, and Japan will learn all about them in due course.

Hitting the U-boat

LORIENT has been bombed again. These submarine bases cannot be hit too often. The U-boat is the last hope to which Hitler clings, and it must be hit wherever it can be found, and at all stages of its career. Mosquitoes carried on the good work by a daylight raid on diesel engine works in the shipyards of Copenhagen, and the rear members of the echelon formation saw a sheet of flame coming from the diesel works where the bombs of the first machine had fallen. Good work!

The Prime Minister prophesied not long ago that the war in Europe would probably be finished before that against Japan had reached a conclusion, and foresaw in that an advantage, in that the United Nations would remain united during the settling of European affairs, instead of tending to fly apart as happened at Versailles. While this remark confirms the idea that Allied strategy is to settle with Germany first, it does not mean that Japan is to be allowed to have things all her own way in the meantime.

PACIFIC AGGRESSION : A Japanese Nakajima Navy G-97-2 torpedo bomber attacking American naval units at Santa Cruz.

There are signs that the Yellow Peril is massing forces for another attempt to break America's communications with Australia, and possibly to invade Australia. Mr. Curtin, the Australian Premier, has sounded a note of warning, and the increased activity of Gen. MacArthur's bombers in the South-West Pacific shows that he is alive to the possible threat. Those bombers have been ranging more widely than ever since the reconquest of Papua, and their raids have grown in frequency and intensity. We may be sure that the Pacific situation was not overlooked during the discussions at Casablanca. Defence by bombers is a new form of warfare first practised from the Australian base, and it has served its purpose well. The time will come when sea power aided by the air will strike at the body of the Japanese octopus (to use Mr. Menzies' words), and then the tentacles will wither.

While talking about Japan, mention should be made of the constant air attacks now being made on the enemy's communications in Burma. The waterways (the Irrawadi and other rivers) are the most important, and the railways come next. Both are constantly bombed by the R.A.F. and the Americans in India. Akyab port is a favourite target, and sampans on the waterways are constantly shot up by fighters. Most of the railway stock is north of the destroyed bridge at Sagaing (the destruction of that bridge was a good piece of work), and that simplifies the task of the Allied airmen. In recent attacks, comprising a total operational period of 115 minutes, 11 locomotives, 83 trucks and other railway equipment have been put out of action.

WING LOADING : R.A.F. ground crews use a captured Italian Saiman biplane to "sit" for an official photographer.

Bursting the Boilers

THE same sort of thing has been going on steadily in the occupied countries of northern Europe. Factories are useless unless their products can be taken to the fighting fronts, and ever since May last the fighters and fighter-bombers from Great Britain (including the Mustangs of Army Co-operation Command) have been making concentrated attacks on railway engines, trucks, signal boxes and other things which contribute to railway transport. Of course, if this form of attack is to produce any useful results it must be kept up without intermission over a long period. That has been done. In the past nine months one Fighter Group, for example, has shot up over 400 engines. That, of course, is only one example of the results achieved. The total must make a serious difference to the amount of stuff which the Germans can transport to Russia and elsewhere.

During the blitz period in the winter of 1940-41 great disappointment was felt at the failure of our searchlights to give effective aid to our defences. It was not the fault of the men who worked them; it was a result of the

WAR IN THE AIR

ENEMY AIR LOSSES TO JAN. 30th.

	Over G.B.	Over Continent	Middle East
Jan. 24	0	0	1
" 25	0	0	0
" 26	1	3	0
" 27	0	1	0
" 28	1	0	0
" 29	0	5	0
" 30	0	2	0
	2	11	1

Totals : West, 6,597 ; Middle East, over 5,206.

practice of divided command and operational control, by which the War Office provided such searchlights as it chose for the use of Fighter Command, and those searchlights were not up to the job. It is very satisfactory to learn that now the beams can give most material help to our night fighters and to the A.A. gunners.

It has now transpired that during the last night raid on London the searchlights were largely responsible for the destruction of several raiders, and helped also to demoralise the whole of the attack. Wing Cdr. C. M. Wight-Boycott, who shot down four raiders that night, made the following report :—

"My impression," he said, "was that many of the raiding aircraft were turned back by the A.A. barrage. As soon as they were turned back they were faced with an enormous number of searchlights, and they obviously did not know which way to go. Some of them appeared to be turning in circles. My second, third, and fourth victims were pointed out to me by searchlights. The searchlight operators did a splendid piece of work."

WINTER PROBLEM : Clearing the snow from the runways of an airfield in Canada

Daylight Raids on Berlin

SATURDAY'S two daylight raids on Berlin by Mosquitoes may not unfairly be called a *jeu d'esprit*, and that without any intention of depreciating the gallantry of the daring crews of the Mosquitoes. They were timed to interfere with broadcast speeches by Göring and Göbbels ; and the pompous Germans, both speakers and listeners, would be particularly annoyed by the interruptions. The head of the *Luftwaffe* was kept away from the microphone for a good hour. The anniversary of the rise of the Nazi party to power in the Reich was solemnised by the appearance of British bombers over the capital, which Göring once assured the inhabitants could never happen. Although we in Britain mourn the loss of the crew of one Mosquito, and although we do not know what damage was done, it is impossible to refrain from describing the incident as deliciously impertinent—almost flippant, and flippancy is most obnoxious to the goose stepping Huns.

BRITISH & U.S. AIR LOSSES TO JAN. 30th.

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent F'trs.	Middle East A'crft.
Jan. 24	0	0	0	2
" 25	0	1	0	0
" 26	0	2	4	0
" 27	0	8	0	1
" 28	0	0	1	0
" 29	0	5	3	0
" 30	0	12	0	2
	0	20	8	5

Totals : West, 5,124 ; Middle East, about 2,064.

Last week also saw serious raids on Dusseldorf and Hamburg, which, we all hope, reduced the number of U-boats which might soon have been out in the Atlantic. Other places were also raided.

Turning to a bombing campaign which should have an immediate, or more immediate, effect on the course of the war, Malta and the other Allied bases in the Mediterranean have lately been hitting out hard at targets in Sicily and Southern Italy. Travellers to and from the East thirty-three years ago may remember seeing Messina, on the eastern tip of Sicily, laid in ruins by an earthquake. Liberators have not produced quite such complete ruin, but they have damaged the harbour installations and shipping in the port, and many other places in Sicily have felt the vengeance of the squadrons from Malta. Railways and trains in the south of Italy have also been bombed.

The Russian armies go on from strength to strength. At Stalingrad they have captured 16 German and Rumanian Generals, including the recently promoted Field Marshal Paulus. In the last three weeks of January they took great booty, including 744 aircraft, 1,517 tanks, and 6,523 guns.

DESERT AIR STAFF : Air Vice-Marshal Sir Arthur Coningham, K.C.B., A.O.C. Western Desert (right), with his staff at Air Headquarters in Libya. Left to right : Wing Commander J. E. Dunning ; Air Commodore J. Whitford, O.B.E. ; Group Capt., now Air Commodore, H. Broadhurst, D.S.O. and Bar, D.F.C. and Bar, A.F.C. and Bar, Senior Air Staff Officer ; Group Capt. S. H. V. Harris ; and Air Commodore T. W. Elmhirst, A.F.C.

HERE AND THERE

Straws that Show—

MR. W. R. D. PERKINS (Con., Stroud) recently asked the Prime Minister to consider the appointment of an additional Permanent Under-Secretary of State to the Air Ministry to take charge of civil aviation, in view of the importance of civil transport in the Empire.

Mr. Attlee, however, did not think the time was yet ripe for such a course.

—the Way of the Wind

IN America, appeals have recently been made for the appointment of a special Congressional aviation committee. Representative Nichols, pressing for the Committee to be formed, said: "The country that is ranked first with fast cargo-carrying planes will dominate the post-war world."

Trade Recommendation

MEANWHILE a joint committee has been formed by the Association of British Chambers of Commerce, the Federation of British Industries, and the London Chamber of Commerce to consider post-war development of British civil aviation.

The Committee, of which Mr. Oliver Simmonds, M.P., is the Chairman, has recommended to Sir Archibald Sinclair, the Air Minister, that the Government should form a standing committee of both Houses of Parliament to cover the whole field of commercial air transport and civil aviation.

A number of other recommendations are being considered by the Committee before submitting them to the authorities.

FLAPS ON THE MILES M.28, a description of which appears on pp. 115-118. They are of the auxiliary aerofoil low-drag type, and are combined with fuselage air brakes and drooping ailerons.

New Curtiss Dive-bomber

IT has just been announced in America that the Curtiss Wright Corporation has been delivering to the U.S. Army Air Force a new dive-bomber known as the A-25. This machine is a sister to the Navy's Curtiss Helldiver and it is claimed to have a higher speed, longer range and more striking power than any other dive-bomber in use at the present time.

The A-25 is a mid-wing two-seater monoplane, with a Wright Cyclone engine of 1,700 h.p., Curtiss electric airscrew and retractable landing gear.

Members of a Russian mission which recently visited de Havilland's are here seen with some of their hosts. From left to right the group is Mr. Zagudæv, Mr. C. T. Wilkins, Col. Dragun, Mr. Martin Sharp, Col. Borissenko, Major H. de Havilland, Capt. Dicky, Mr. Bentley, Mr. C. C. Walker, Mr. W. A. Tamblin, Major Rudoy and F/O. D. Crichton.

Russia Needs More Aircraft

AIR MARSHAL R. M. DRUMMOND, Deputy Air Officer Commanding the R.A.F. Middle East, who recently visited Russia, has stated that the principal problem of the Red Air Force is the supply of aircraft and not the supply of pilots.

While in Russia the Air Marshal visited factories and saw air and land forces in operation.

Important Dates

IN view of coming events and the repeated promise of twenty-four-hour bombing of Germany, these dates are significant:—

Wednesday, January 27th. — First American daylight raid on Germany, when Wilhelmshaven was attacked by U.S. bombers.

Saturday, January 30th.—First daylight raids on Berlin. British Mosquito pilots made two visits on that day.

Achieving the Impossible

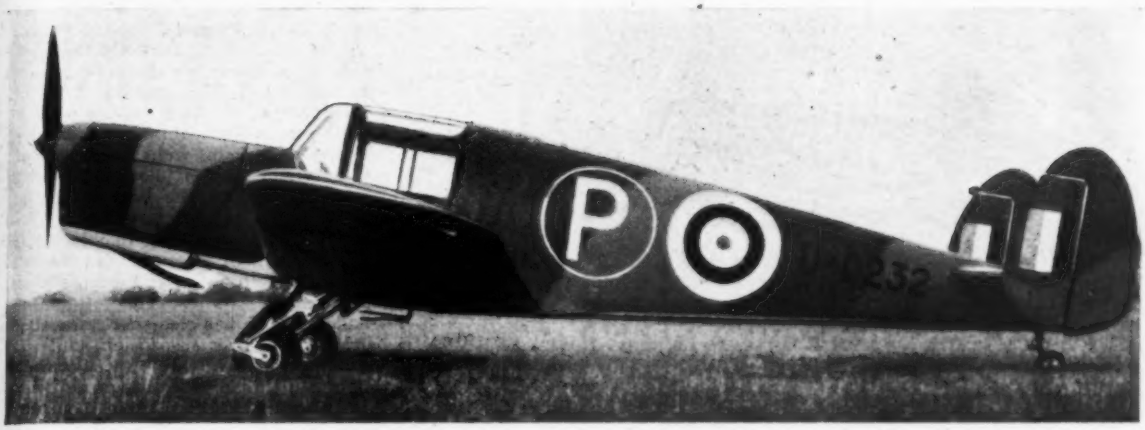
ACCORDING to a recent statement by Mr. Donal Nelson, chairman of America's War Production Board, his country's war production was "achieving the impossible" and they could view 1943 with the utmost confidence.

It would not be an easy year, he added, for they had many problems of supply, transportation and man-power to solve, but if the war was to be won in 1944, then all preparations must be complete by the end of December next.

Irish Air Line Wages

WHEN applications for wage increases of certain employees of *Aer Lingus Teoranta* and *Aer Rianta Teoranta* (Irish Air Lines) were being considered before the Eire wages tribunal recently, the secretary to the company (Mr. J. F. Dempsey) said that the company was living on a subsidy, and they were hardly even a free agent to agree to anything in the way of bonus or otherwise.

They prepared estimates, which they submitted to the Minister for Industry and Commerce, but he was not so sure that they were in a position to pay.



The Miles M. 28 has been designed for training or for use as a communications aircraft. It may have the Gipsy Major Series III or III S engine, or the Cirrus Major 150 or Gipsy Major Series II A

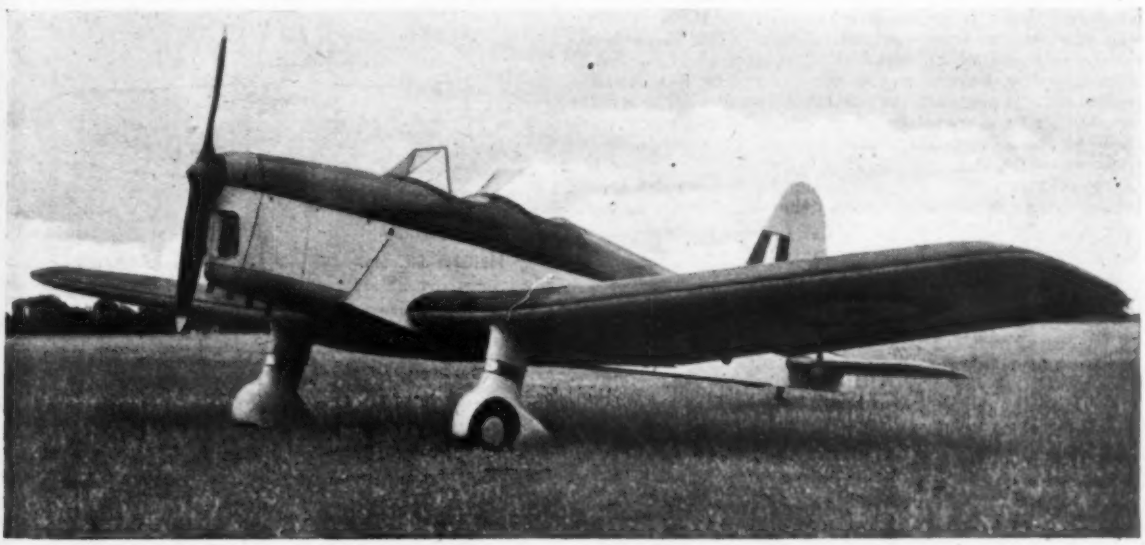
Two Miles Types

The M.18 Elementary Trainer and the M.28 Intermediate Trainer and Communications Aircraft

ECONOMY is the keyword in the design of the two training types produced by Phillips and Powis Aircraft, Ltd., illustrated herewith. Economy in structural materials used in their construction; economy in man-hours required to build them; economy in actual operation, due to the relatively low power of the engines for which they were designed; and, of course, economy in the manufacture of the engines themselves.

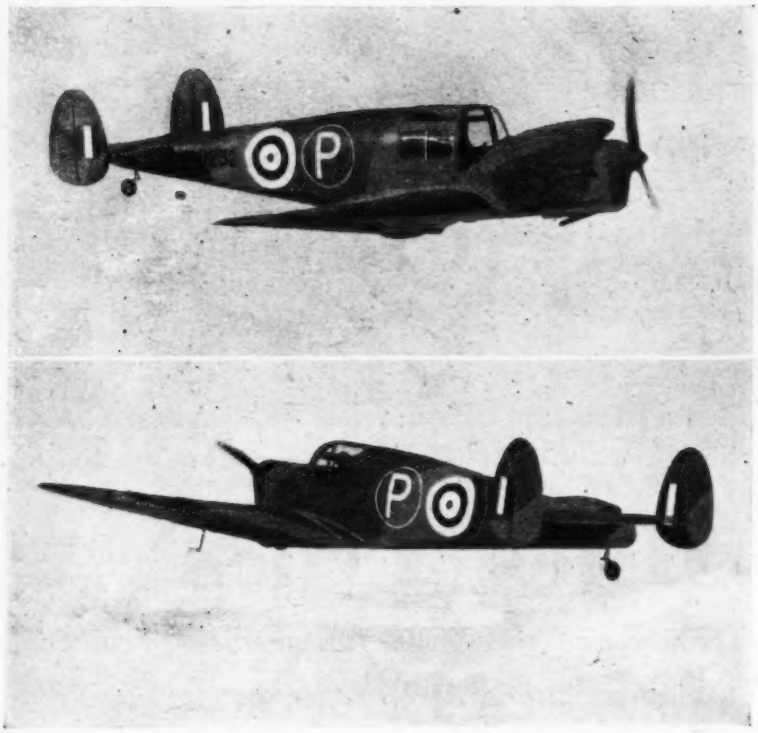
In spite of the aim at economy, the designers have not lost sight of the importance in training aircraft of characteristics comparable with those of the more powerful Service types for which they form the preparation, and performance has been kept up to very good figures. The Miles M. 28, for instance, has a top speed of 176 m.p.h. in one form; yet the stalling speed has been kept down to 40 m.p.h. so that the speed range is well above four to one, which must be regarded as exceptionally good for a low-powered aircraft. Even the elementary trainer, the Miles M. 18, has a top speed of 145 m.p.h. and a landing speed of 39 m.p.h., which is not very much below the four to one speed-range figure, and shows what clean design and trailing edge flaps can do in the way of improving performance.

The Miles M. 28 has many uses, but it was designed to fulfil two major functions: as a two-seater *ab initio* and/or intermediate trainer, and as a three-seater communications aircraft. In addition, the machine can be adapted for a



The Miles M. 18 two-seater elementary trainer has Gipsy Major Series III engine and fixed-pitch airscrew

D



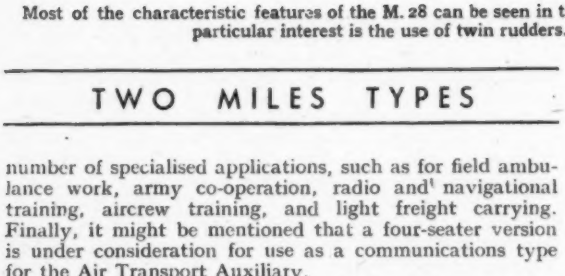
Most of the characteristic features of the M. 28 can be seen in these two views. Of particular interest is the use of twin rudders.

TWO MILES TYPES

number of specialised applications, such as for field ambulance work, army co-operation, radio and navigational training, aircrew training, and light freight carrying. Finally, it might be mentioned that a four-seater version is under consideration for use as a communications type for the Air Transport Auxiliary.

The difference between the ordinary trainer and the advanced types is particularly marked for those pilots who graduate to multi-engined aircraft. The M. 28 has side-by-side seating, an enclosed cabin, and wheel control. A noteworthy feature is the very complete instrument equipment. A standard Service blind-flying panel is fitted in addition to a complete set of engine instruments, including those normally associated with supercharged engines.

Objections raised in the past to side-by-side seating have included the restriction of view on the side opposite to the pupil or instructor. In the M. 28 this point has been given careful study, and it is claimed that the forward view from the cabin of this machine is superior to that of any type of open-cockpit *ab initio* trainer in current use. The cabin is unusually roomy, being 4in. wider than that of the Proctor at the pilots' seats and 5in. higher from the bottom of the seat pan to the roof structure.

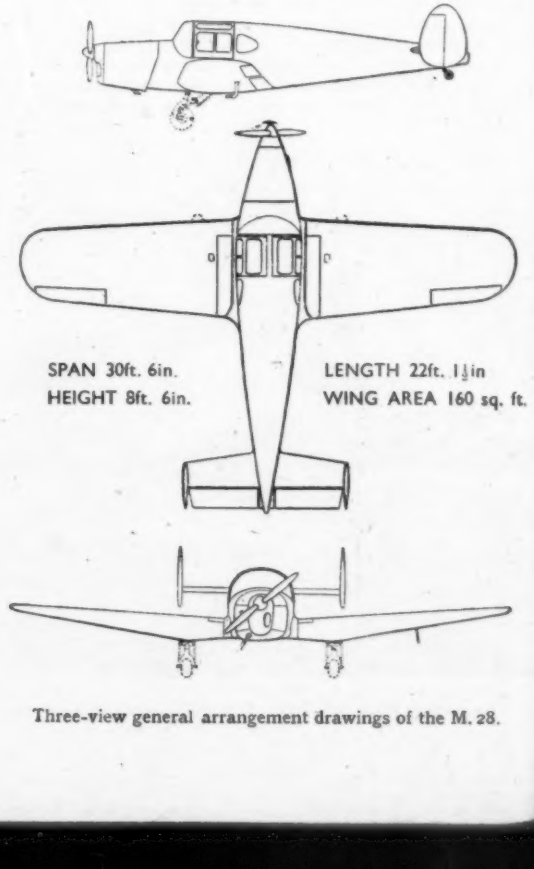


The seating arrangements in the three-seater communications version of the M. 28, is well shown in this sketch. Note the raised position of the single seat.

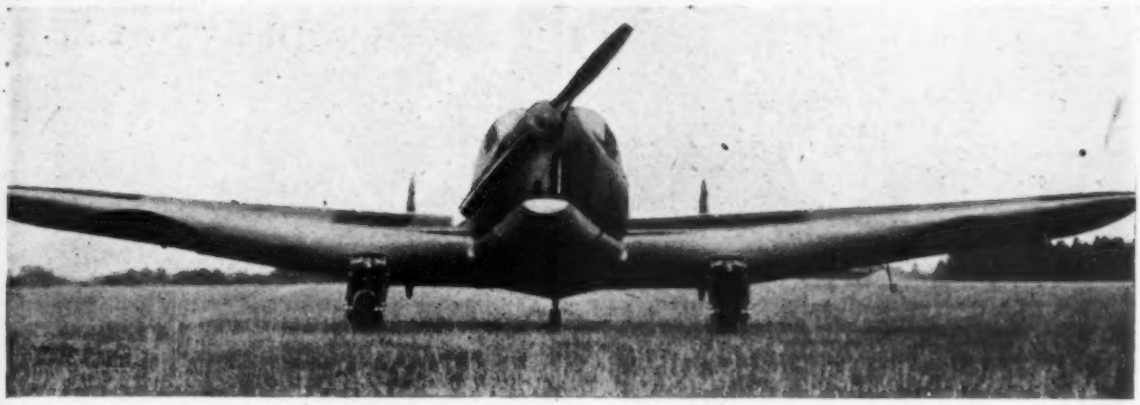
Of wood construction, the M. 28 has a wing span of 30ft. 6in., an overall length of 22ft. 1½in., and a gross wing area of 160 sq. ft. The retractable undercarriage has oleo shock absorber struts with lever suspension, and the Bendix brakes are mechanically operated. The wheel track is wide (9ft. for a span of 30ft. 6in.), so that the stability on the ground is very good. The wings are fitted with Miles low-drag auxiliary flaps combined with a fuselage air brake and dropping ailerons.

Weights and performance differ somewhat according to the particular version. Following are some typical examples.

The two-seater trainer version with Gipsy Major Series III engine has a tare weight of 1,460 lb., and the disposable load is 568 lb. made up as follows: Fuel (20 galls.), 150 lb.; oil (2 galls.), 18 lb.; instructor and parachute, 200 lb.; pupil and parachute, 200 lb.; gross weight, 2,028 lb. The three-seater communications version, with the same engine, has the same tare weight but carries more fuel so that the disposable load is greater. It is composed of petrol (35 galls.), 262 lb.; oil (3 galls.),



Three-view general arrangement drawings of the M. 28.



Special care has been taken in the design of the Miles M. 28 to give a good view to both occupants in spite of the side-by-side seating arrangement.

27 lb.; pilot and two passengers and their parachutes, 600 lb.; gross weight, 2,349 lb.

When the engine fitted is a Gipsy Series III S the tare weight of the two-seater trainer goes up to 1,480 lb. The disposable load remaining the same, the gross weight goes up to 2,048 lb. In the case of the three-seater communications version, the gross weight is correspondingly increased to 2,369 lb. These weights include constant-speed airscrews.

In its simplest form the M. 28 has a Cirrus Major 150 or a Gipsy Major Series II A engine with fixed-pitch airscrew. The tare weight, for both the two-seater trainer and the three-seater communications version is then 1,400 lb. The trainer carries 20 galls. of fuel (150 lb.), 2 galls. of oil (18 lb.), instructor and pupil and their parachutes (400 lb.). Gross weight, 1,960 lb. The disposable load of the three-seater is exactly the same as in the two previous cases, so that the gross weight becomes 2,289 lb.

The estimated weight figures for the A.T.A. four-seater version are: Tare weight, 1,450 lb.; pilot and three passengers, 680 lb.; fuel and oil, 168 lb.; three parachutes (or additional fuel), 60 lb. Gross weight, 2,358 lb.

At an all-up weight of 2,050 lb. the trainer version with Gipsy Major Series III engine and constant-speed airscrew has a maximum speed at sea level of 160 m.p.h., a cruising speed of 150 m.p.h. at 3,500ft., a stalling speed of 40 m.p.h., and an initial rate of climb of 1,250 ft./min. The cruising range is 715 miles and the duration 4.75 hours.

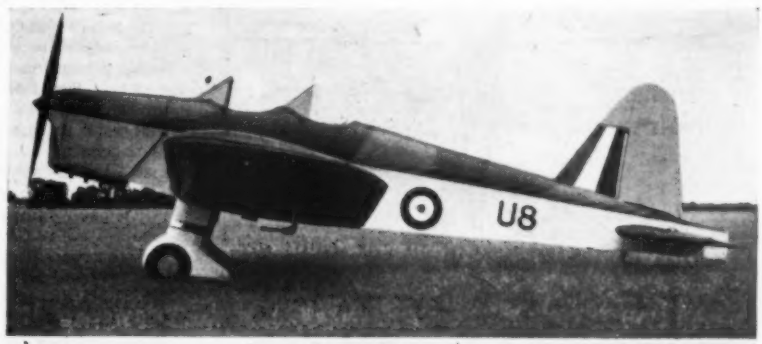
With the Gipsy Major Series III S engine and constant-speed airscrew the maximum speed at the rated altitude of 7,000ft. is 176 m.p.h., and the cruising speed 166 m.p.h. The stalling speed is 40 m.p.h., the cruising range 700 miles, and the duration 4.25 hours. The initial rate of climb is 1,400 ft./min.

Even the "plain" version, with Cirrus Major 150 or Gipsy Major Series II A engine and fixed-pitch airscrew has a maximum speed at sea level of 155 m.p.h. and a cruising speed of 140 m.p.h. at 1,000ft. The stalling speed is 40 m.p.h., as before, and the initial rate of climb 950 ft./min. The cruising range is 700 miles and the duration 5 hours.

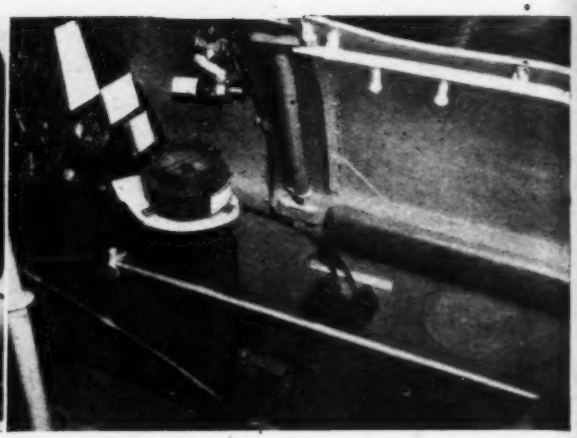
The M. 28 has been stressed for an all-up weight of 2,500 lb. If the fixed-pitch version is used as a light freight carrier the disposable load is 1,100 lb. Allowing 200 lb. for pilot and 170 lb. for petrol and oil, the pay-load is 730 lb. This represents two spare Gipsy Major engines, 40 Bren guns, nearly 100 gallons of petrol, or 70 gallons of water. The version with constant-speed airscrew will carry an even greater load without increased take-off run, but the strength factors will, of course, be reduced.

The Miles M. 18 Elementary Trainer

This machine, a two-seater fitted with Gipsy Major Series III engine, is similar in most structural characteristics to the Miles Magister. Simplicity of control and manœuvrability have been improved by the introduction of an entirely new type of wing which is the outcome of considerable research. The cockpits are considerably more roomy than those of the Magister, and the layout and details of the controls have been much improved. Full night and blind-flying equipment is included.

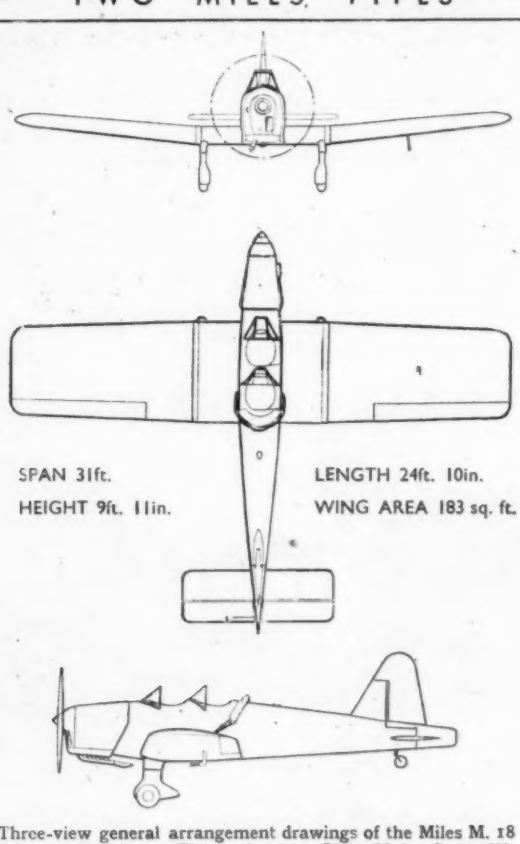


The Miles M. 18 may be regarded as a Magister replacement and has many features in common with that well-known trainer. The tail is, however, quite different.



Inside the cockpits of the Miles M. 18. In addition to the usual flying and engine instruments, this machine is equipped with the standard Air Ministry blind-flying panel.

TWO MILES TYPES



Three-view general arrangement drawings of the Miles M. 18 elementary trainer. The engine is a Gipsy Major Series III.

The M. 18 has a wing span of 31ft., an overall length of 24ft. 10in., and a wing area of 183 sq. ft. Wing and power loadings are 10.48 lb./sq. ft. and 12.76 lb./h.p. respectively. The tare weight is 1,306 lb., and the normal disposable load is composed as follows: Pilot, 200 lb.; petrol (24 gallons), 185 lb.; oil (2½ gallons), 22 lb.; payload allowance (for pupil or extra equipment), 205 lb. Gross weight, 1,918 lb.

Performance figures are as follows: Maximum speed, 145 m.p.h.; cruising speed, 125 m.p.h.; landing speed, 45 m.p.h.; stalling speed, 39 m.p.h. The initial rate of climb is 1,280 ft./min., and the service ceiling 19,000ft. The duration is 3.5 hours at 66 per cent. power (125 m.p.h.), giving a still-air range of 437 miles.

Each cockpit of the Miles M. 18 has a bucket-type seat to suit standard seat-type parachutes. Harness gear is fitted to both cockpits and a blind-flying hood, similar to that of the Magister, is fitted to the rear cockpit. The equipment includes full night-flying and blind-flying equipment, fire extinguisher, map cases, respirator stowage, and control locking bar. On the port side of each cockpit is a handwheel for trimming the elevator tabs. Also mounted on the port side in each cockpit are the throttle and mixture control levers. They are grouped in a neat unit with the flap lever. Dual controls are fitted, the Magister type of control column unit being used, but having the column and aileron torque shaft modified.

The Five-piece Flap Gear

The flap gear has Miles patent split trailing-edge flaps fitted over the full span between ailerons. It consists of five portions: two outer wing flaps, two centre-section flaps, and one flap under the fuselage. The flaps are operated by the well-known Theed vacuum mechanism, similar to that used on the Magister, but a follow-up valve arrangement enables the flaps to be set in any desired position instead of merely the two positions on the Magister.

The undercarriage consists of two separate cantilever units, each comprising an oleo leg designed by the British Landing Gear Co. At the top end each leg is attached to the centre-section front spar by two light alloy castings. The wheels, which are interchangeable with those of the Magister, are mounted on stub axles instead of on forks, thus simplifying removal. The conventional type of spat has been discarded in favour of a simple strut fairing. The wheels themselves are not faired. The wheel brake system is generally similar to that of the Magister. A standard Bendix differential unit is situated in the front cockpit and is connected with both sets of controls (instructor's and pupil's). The tail wheel was also designed by the British Landing Gear Co. The fork which carries the wheel is free to rotate through 360 deg.

Two fuel tanks, each of 12 gallons capacity, are carried in the centre section, between the spars, one on each side of the fuselage. A Simms type contents gauge is fitted to each tank and is visible from both cockpits. A Vickers three-way cock, with controls to both cockpits, governs the supply.

The oil tank is situated in the leading edge of the centre section of the wing, on the port side. The pipes from the tank enter the fuselage and continue to the fireproof bulkhead, whence flexible tubing leads to the engine.

Fleet Air Arm Debate

Lords Discuss Its Out-of-date Equipment and Disagree on Question of Responsibility

THE Fleet Air Arm and its out-of-date aircraft were the subject of a spirited debate in the House of Lords when Lord Winster rose to ask the Government what measures should be undertaken to see that this Service was equipped with the most modern aircraft we could give them, and to "move for Papers."

The main points made by Lord Winster were that not only was the Fleet Air Arm equipped with "extremely bad aircraft" when war broke out, but that it was still so ill-equipped to-day as to be robbing the country of opportunities at sea and at the same time "inflicting very unnecessary perils upon the pilots." While it would require a great deal of knowledge and information before one could decide whether the responsibility for this state of affairs lay with the Admiralty, the Ministry of Aircraft Production, or elsewhere, it was the War Cabinet which had to decide how we were going to win the war and, therefore, the responsibility must, in the ultimate issue, come back to the War Cabinet.

Lord Winster also suggested the factors which influenced the matter; there was the very great difficulty with which the Navy had had to contend from "the older generation of officers whose minds were not sufficiently flexible to enable them to appreciate the full impact of the air weapon upon sea warfare—it was the old story of the Admirals trained in masts and yards who resented the introduction of steam. Another difficulty was that because Admiralty orders had always been small compared with those of the R.A.F., the Fleet Air Arm had had to rely upon "some of the smaller firms of the industry," and out of the very small percentage of industry available for the work of the Fleet Air Arm, very big difficulties seemed to have arisen in regard to two firms.

Labour Idle

There was no secret about the fact that the workmen at Faireys were complaining about having to stand idle yet being refused permission to go elsewhere. There had been strikes, discussions, and acrimonious meetings with the management, and all these things had been reported to the M.A.P., to the Air Ministry and to the Admiralty in December, 1941. A year later things were stated to be still astounding and deplorable; the Fleet Air Arm were flying in obsolete machines yet men were still standing idle and were refused permission to go where there was work for them to do. He did not know what happened, but shortly after Sir Stafford Cripps became Minister of Aircraft Production he visited a certain factory in the Home Counties—they had not been told where—and found it necessary to appoint a managing director to take complete control of that factory; and this was the fourth year of the war! If that factory was Faireys, then he thought it still more important that some explanation should be given, and we should be told why Sir Richard Fairey remained in America. He had been there since 1940, employed, Lord Winster believed, in work for the British Purchasing Commission.

"I have no doubt his work is considered far more important than work with his firm here in England," said Lord Winster, "and no one would wish to presume to say on which side of the Atlantic Sir Richard Fairey should be, but I think it should be made very clear, if, indeed, it is the case that he is doing more valuable work in America than he could do with his own firm in England, because a great deal of misapprehension and criticism exists upon that point, especially because the firm of Fairey seems to have fallen into a very considerable state of disorganisation during the absence of Sir Richard Fairey in America.

Another Fleet Air Arm Factory was Blackburns, and it was a matter of great regret among the workers there that their war effort seemed to be so very disappointing. He had heard no criticism of the management or organisation at Blackburns, but he had heard of a real feeling of frustration at the fact that they, a Fleet Air Arm factory, have no up-to-date, efficient aircraft to manufacture for the Fleet Air Arm. He would not go into details of the work they had been doing, but he would ask this very simple question: "Is it the case that the firm of Blackburn has got an efficient, up-to-date aircraft for the Fleet Air Arm at the present moment?"

F.A.A. Priority

Other points made by Lord Winster in the course of his speech were that the Fleet Air Arm must have very much higher priorities than it had hitherto enjoyed; that the aircraft specified by the Admiralty had in many cases been required to fulfil far too many purposes and had been hybrids; that the story of the dive-bomber was a very melancholy one indeed, so far as operations at sea were concerned, and reflected very little credit on those concerned; and that, in reference to the torpedo bomber, the development of which had been allowed to lag behind, all the Minister of Aircraft Production could say in July, 1942, was, "We have a new type coming along for the Fleet Air Arm." It would be interesting to know if it had come along yet!

Saying that he had endeavoured to speak with moderation, and, he hoped, with discretion, Lord Winster added "I must, in conclusion, make it quite clear that I do feel that the present equipment of the Fleet Air Arm implies grave faults on the parts of some responsible people, for otherwise it could not be the case that the Fleet Air Arm, with the tasks which it has imposed on it to-day, should be given such wretched weapons with which to perform them."

Lord Beaverbrook followed Lord Winster and began by saying that he thought there was a considerable case made against the Government, but there were some other features he wanted to present to them. First of all there never had been any priority difficulty so far as the Fleet Air Arm was concerned; the maintenance and spares for the Fleet Air Arm was in the charge of the Admiralty and he thought it was most wonderfully well done and an example to other Services. He did not take the pessimistic view of the equipment of the Fleet Air Arm that his noble friend had presented to the House, and he would ask the distinguished industrialists in the House to bear him out when he said that the aircraft of the Fleet Air Arm and all other types of aircraft depended for quality on the firms producing them. The responsibility of the firm also prevailed in the matter of design.

Private Venture Types

"The work of the firm is almost invariably a private venture," said Lord Beaverbrook, "the design is a private venture, put forward by private enterprise, by private capital." And he instanced the design and development of the Spitfire, Hurricane, Lancaster and Mosquito. It was true that the Ministry issued the specification, but that was usually improved by the firm, frequently amended, and sometimes rejected; in the case of the Spitfire and Hurricane, the designs produced by the firms did not at all resemble the specification issued by the Air Ministry.

Engine design was entirely in the hands of the firm. Subsequent development of prototypes, both in engines and aircraft, depended also almost entirely on the firms, not on the Ministry; they were in the hands of the fac-

FLEET AIR ARM DEBATE

tories—in the case of engines, altogether. Help came from the Ministry's experimental stations and the best work in helping the development of engines and aircraft came from the test pilots and the R.A.F. pilots.

The Fleet Air Arm, went on Lord Beaverbrook, had had great help from the American programme, and mentioned the "very considerable supply" of Catalinas and the "great numbers" of the Hudsons of Coastal Command. (But he did not mention that nearly all the Catalinas are also with Coastal Command of the R.A.F., or explain what this had to do with the Fleet Air Arm.)

As regards the dive-bomber, he said there was an explanation which the Government need have no hesitation in giving, and he dismissed the matter of torpedo aircraft by saying that its torpedo was part of its equipment, and, as such, had nothing to do with the aircraft industry. He then went on to discuss production in general terms, with special reference to Ministerial planners who "sit in committees all day long" and "who have a paper output that is unexampled; put in a strong plea for individualism, which was, he said, being paralysed by committee organisation; and spoke of the art of war and the "determining purpose of a nation bent upon a holy cause"—none of which could be said to have explained away the Fleet Air Arm's slow, out-of-date biplanes.

If It Meant Anything

Viscount Trenchard, in fact, referred to Lord Beaverbrook's oration as "the amazing speech to which we have just listened," and said he was not going to attempt to follow it.

"It struck me," he said, "that if it meant anything it was made with the idea of showing that no organisation was any use, and also of showing that there was nothing wrong with the Fleet Air Arm or any other part of our production."

He agreed with Lord Winster that the Fleet Air Arm had been let down, to put it mildly. The types of machines used in the Fleet Air Arm were of old design, and, although good at the time they were produced, were now out of date. Failure to produce the right type of aircraft was the direct responsibility of the Admiralty. It is they who say what characteristics they require and what the aircraft are required to do. But they had never understood air and, though they now realise the importance of the Fleet Air Arm, they still have no conception of air war. How could they? How many of them had ever flown? Very few.

The backwardness of the Fleet Air Arm torpedo machine was undoubtedly due to the type of mind, which persisted until 1940-41, which openly said that the modern capital ship had nothing to fear from aircraft. "Even now," he added, "I think that the Admiralty outlook is not, 'How shall we use the air to the best advantage?' but 'How shall we restore the capital ship to its supremacy by the use of the air?'"

He would therefore like to move an amendment to the Motion to the effect that the best way to make certain that the Fleet Air Arm was properly equipped was for it to be taken over by the R.A.F.

Lord Keyes, who took the unusual course of making a maiden speech on the day he had been introduced to the House, said he wanted to try and put an end to inter-Service controversy and to make the public, and their Lordships, realise the vital importance to the Navy of being left free to develop its naval aviation. Most of his address was a historical survey which went back to his own first flight in 1912 and which worked up to the contention that had the Navy not been deprived of its aviation in 1918, but been allowed to develop it, we should have been in a very different position to-day. He also expressed the opinion that had the Government put Coastal Command under the Navy five or ten years before the war, it would not have had to go to America for its aircraft.

Dealing with the out-of-dateness of Fleet Air Arm machines, Lord Cherwell said that to a certain extent every machine in the Service was bound to be out of date. It was impossible to change types quickly, and in the Fleet Air Arm they had special difficulties in a small floating airfield, restricted hangars and lifts. This meant that the aircraft had to be hybrids to some extent because there wasn't room for some of every conceivable kind. In the early part of the war it was held to be necessary to have two-seater fighters, and it was only recent developments enabling a single-seater to "home" on its carrier which had made it possible to have single-seater fighters.

He outlined the main problems and difficulties of getting any new type into production, and said it took two-and-a-half to three years; aerodynamics was not an exact science, and factors appeared which could not be predicted; the designing of an aircraft was more an art than a science.

F.A.A.'s Fine Record

Finally, Lord Cherwell reminded the House of the fine record of the Fleet Air Arm in the war—"the enormous successes it has scored in many fields"—and said this did not justify the gloomy picture painted by Lord Winster. He did not think it right to suggest the Fleet Air Arm was so grossly ill-equipped, and there was no real reason, in his view, to apologise for it. The Government was just as anxious as the noble Lord to give the Fleet Air Arm the best possible aircraft, but there were physical limitations and nothing that could be done about them.

After Lord Gifford had remarked that he thought the debate was a year too late, Lord Winster replied to Lord Cherwell and said that it seemed to him that there had been a tendency to design aircraft to fit the carriers instead of designing carriers to fit the aircraft. He agreed that it took nearly three years to produce a new type, and that just showed what penalties were now being paid for lack of foresight in the past.

Planning of Science

MANY distinguished scientists took part in the conference held at Caxton Hall, London, on Saturday and Sunday last. The conference was organised by the Association of Scientific Workers, and the chair was taken by Sir Robert Watson-Watt, president of the Association. In view of the importance of aeronautical research, it was somewhat curious that no scientific worker in this branch of science was among the speakers. We do not, of course, forget the work of the chairman of the conference in the field of radio location, but that can scarcely be termed aeronautical research.

The nearest approach to a direct link with flying was the speech by Air Chief Marshal Sir Philip Joubert de la Ferte, who discussed "Some Aspects of the Relation of Science with the Royal Air Force." Sir Philip said that the appointment of two sub-committees of the Air Defence of Great Britain in 1935 resulted in the development of radio location. In 1939 a team of scientists was formed at an Operational Research Section to investigate radio aids to air warfare. The activities of O.R.S. were increased to cover a wide field for all three Services. Scientist and soldier now worked side by side. It was important that the Service man should state the need and put requirements to the scientist for investigation. The scientist should not be asked to judge military matters, but he should call the attention of the military staffs to any developments that might be of value.

Col. W. C. Devereux spoke on the subject: "Relationship Between Management and Scientific Staffs as it Affects Production." Col. Devereux is well qualified to deal with this subject, for High Duty Alloys employ about 600 persons on the laboratory and development staffs. The controller of the laboratories, a scientist, is on the board of directors, and there is direct liaison between management and laboratory staff through a technical committee and sub-committees.

Col. Devereux pleaded for collective research by all firms in a given industry on a much larger scale, and urged increased support from the State.

"HALIFAX"

"We leave tonight at sundown
Expect us back at dawn"

HANDLEY PAGE LIMITED LONDON

Thirty-fourth of the New Recognition Series

Aircraft Types and Th

FAIREY SWORDFISH

A GREAT deal has been said lately about improving the equipment of the Fleet Air Arm by supplying it with rather more up-to-date aircraft than some of the types still in service. Admittedly it now has little to complain about where its fighter aircraft are concerned, what with Seafires, Sea Hurricanes and Martlets, but when it comes to the torpedo department, it is something of a mystery to many people why such obsolete types as the Fairey Swordfish are still in operational service.

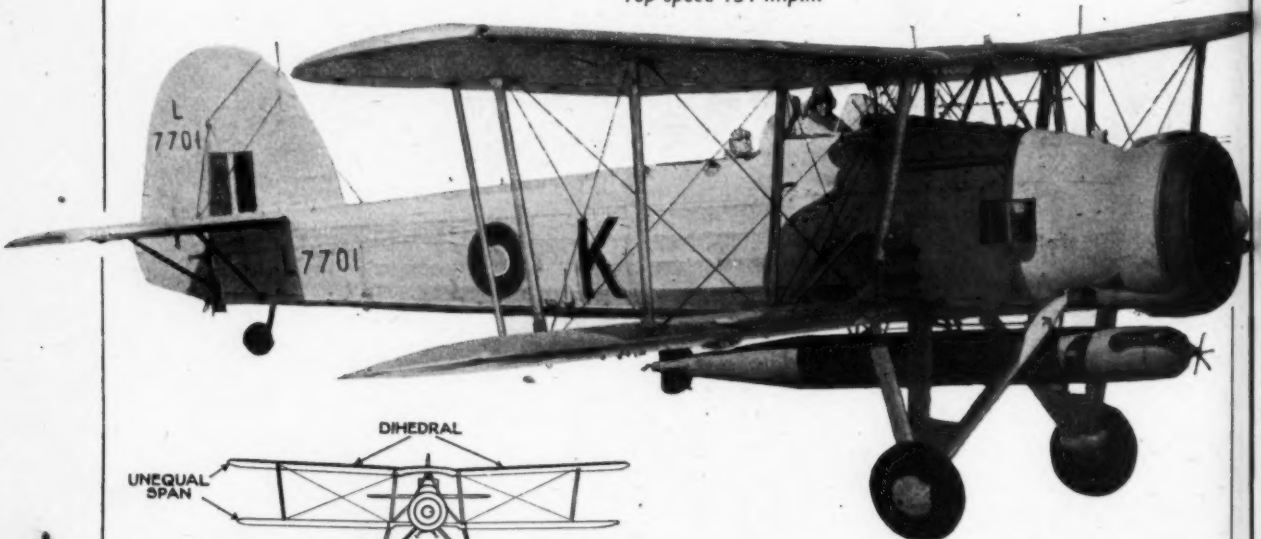
But perhaps the F.A.A. pilots and air crews can feel encouraged by the recent debate in the House of Lords in which Lord Winster championed their cause and was backed up by Lord Trenchard and Lord Keyes.

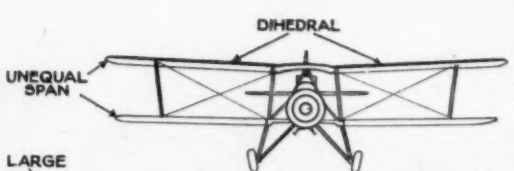
The "Stringbag," as it is nicknamed in the Service, is actually of 1934 vintage, and the prototype appeared as a replacement for the Baffin. But it was 1937 before the first Swordfish reached the T.S.R. squadrons on the aircraft carriers.

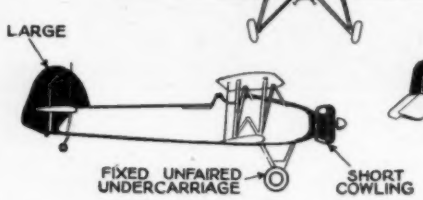
But in spite of its obsolete design, the Swordfish has done some very fine work during the present war, and many of them are, as has been said, still giving reliable, if limited, service. It was Swordfish, for example, which covered themselves with glory in the Taranto victory—or perhaps it would be more accurate to say that it was the pilots and crews of these antique biplanes who played the heroic part in this action. Nor will our readers have forgotten the desperate valour of the men who took off in six Swordfish to try to torpedo the German warships, *Scharnhorst*, *Gneisenau* and *Prince Eugen*, escaping up the Channel from Brest under an umbrella of swarms of modern fighters; such men deserve the latest and best machines their country's engineers can devise.

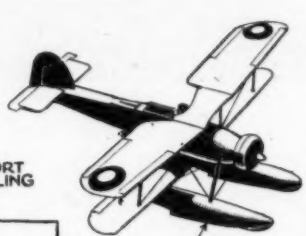
Powered by a Bristol Pegasus IIIM 3 nine-cylinder air-cooled radial engine of 750 h.p., the Swordfish has a top speed of 141 m.p.h. at sea-level or 154 m.p.h. at 7,000ft. Its armament is about on a par with its performance, and comprises a synchronised Vickers machine gun firing through the airscrew disc and a free Lewis gun in the back of the rear cockpit. One 18in. torpedo or an alternative load of bombs is carried. The wheels of the unfaired fixed undercarriage are interchangeable with twin floats, but the landplane version is the more common.

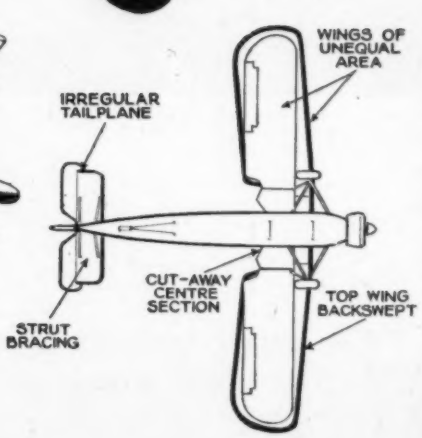
Top speed 154 m.p.h.











DIMENSIONS OF SWORDFISH

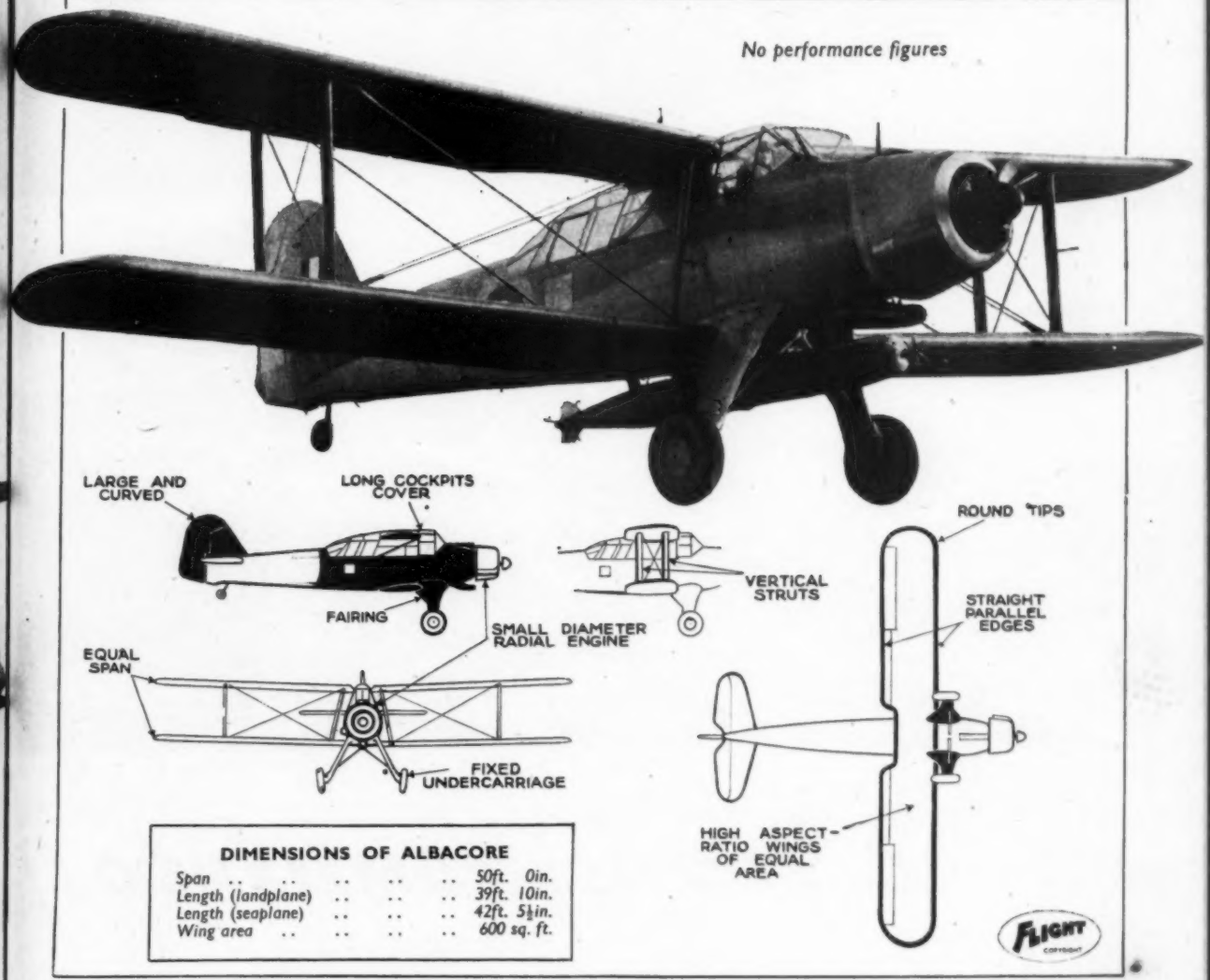
Span	45ft. 6in.
Length (landplane)	36ft. 4in.
Length (seaplane)	40ft. 11in.
Wing area	542 sq. ft.

FLIGHT

...their Characteristics

FAIREY ALBACORE

No performance figures



DIMENSIONS OF ALBACORE

Span	50ft. 0in.
Length (landplane)	39ft. 10in.
Length (seaplane)	42ft. 5½in.
Wing area	600 sq. ft.

THE prototype of the Albacore appeared in 1939 and was delivered the following year to aircraft carriers to supplement and replace Swordfish. At this time it was understood to have been only an "interim" replacement type pending something much more formidable in the T.S.R. category. The "interim," however, had spun out for nearly three years, despite the stimulus of war; and, although the Albacore shows a considerable improvement on the Swordfish in a number of vitally important matters (not the least vital of which is performance), no biplane with fixed undercarriage can be regarded as the *dernier cri* in torpedo aircraft; as Service flying men would express it, there is "no future" in slow biplanes on this job, especially in daylight!

The Fleet Air Arm, in fact, may well contrast its own slow biplane torpedo aircraft with such American types as the Avenger, or even the Devastator.

Albacores, however, have seen plenty of action against the enemy, and such success as they have had must, of course, be credited primarily to the courage, determination and devotion to duty of their gallant crews; how much better those same crews could have done had they been provided with really up-to-date, high-performance aircraft can well be imagined.

The Albacore is powered by a Bristol Taurus II sleeve-valve, air-cooled, radial engine developing 1,065 h.p. at 3,225 r.p.m. at 5,000ft., and giving the aircraft an appreciably higher top speed than that of its predecessor; actual performance figures, however, are not officially available. Incidentally, the current production Albacore differs from its prototype in having a taper to its long-chord cowling. Originally, the untapered kind was fitted.

Like all aircraft designed for operation from carriers, the Albacore has folding wings, while one of the chief structural improvements over the Swordfish is the much better view of the deck enjoyed by the pilot, who sits high up in front of the leading-edge in a completely enclosed cabin. Metal construction is employed, and the fuselage is stressed-skin covered, but the wings are fabric covered, the lower pair having trailing-edge flaps. One 18in. torpedo or the equivalent weight in bombs may be carried. Floats may replace the wheels.

Here they come —
the CURTISS-COMMANDOS!

SECOND PRINTING: Send 10¢ for your copy of this fascinating 96-page history of aviation By Assen Jordanoff, author of "Your Wings", with illustrations of current fighting types. Airplane Division, Dept. M, Curtiss-Wright Corporation, Buffalo, N. Y.

"Swarming down from the skies, Allied gliders and parachute troops captured enemy airfields . . ." More and more in the day's news, words such as these reveal the vital part that transport and cargo planes are playing in the swift invasion of enemy-held areas.

The Curtiss-Commando, the world's largest twin-engined transport, has a leading role in this new and revolutionary phase of the war. These giants of the air telescope weeks into hours and perform prodigies in swift movements of men and materiel.

CURTISS-WRIGHT
Corporation
AIRPLANE DIVISION

FIRST
Since the Birth of Aviation

1920·Curtiss Eagle, first inter-

1928·Curtiss B-2 Condor Bomber for the U. S. Army. Greatest weight carrying airplane of its time. Heavy de-

1929·Curtiss Condor, 2 pilots and 18 passengers, 139 m. p. h.

1933·Curtiss Condor, the first sleeper plane—6 compartments, each with 2 berths, two 720 h. p.

The Air and Shipping

Commercial Aviation Operated by Private Enterprise Under Government Supervision : Groups to Control Areas

By A CORRESPONDENT

RECENT correspondence and Parliamentary debates have brought civil aviation to the fore, and I feel that the great mistake which led to the failure, on the part of Great Britain, to fulfil her rightful role in civil aviation, should be brought to the fore at the same time.

I say "mistake" deliberately, and I cannot leave this without qualifying the word by calling it a "mistake in Government policy." Without wishing to bring up any controversial subject, it must be clear to every thinking citizen of to-day that civil aviation is to be a national service, in the same way that our great shipping lines and the mercantile marine constitute a national service.

The Government's mistake was really a lack of foresight and courage. Correspondence has stressed that shipping took no leading part in the initial development, but one of the main reasons for their holding back has not been properly stressed. There *were* reasons, though.

Lack of Government-inspired incentive to operators and aircraft manufacturers left the operating market open prey to any financial group which found itself ready to take a gamble, political and financial, to "corner" this market. The opportunity was taken, and it succeeded, and one can only say "hats off" to that group for their courage. But this was bad, nationally.

Pre-War Amalgamation

During the ten years before this war, innumerable groups of operators willing to give their services, at a reasonable and fair return, to their country's future in the air, were squashed by political and financial designs. Let no one deny this till they have gone into the facts, and found the true but unpublished basic reasons why such progressive concerns as Imperial Airways, British Continental Airways, North-Eastern Airways and Hillman Airways (to give a few), suddenly, under the whitewash of the Cadman Report, either fell into the clutches of British Overseas Airways Corporation, or were cold-shouldered and ignored by the Department for Civil Aviation, so that they could not possibly run economically.

It would be possible to give many household names of groups of shipping and allied industries which were prepared to take a leading part in financing and operating airlines in 1936; but faced as they were with a cornered market, can anyone blame them for holding off?

No, I do respectfully submit that the wealth of technical and operational experience which this country possesses be harnessed with Government aid; that European, Continental and Empire routes be divided into four, five or six separate groups, and some sort of incentive given by the Government for a balanced, uniform and fair scope for initiative, competition and efficiency.

By all means let civil aviation be divorced from the Air Ministry if that Ministry is not interested or competent to handle it. But let there be found some means whereby civil aviation becomes a development of existing shipping and allied services, and let the country's traditional flair for development and initiative be given a real chance to put the nation in the forefront in this particular sphere, as it is in most other spheres.

Facts have to be faced, though, and this state of affairs has been truly placed on record during the debates on civil aviation instigated by Mr. Perkins in 1936 and resulting in the Cadman Report; the unpublished reports given to the Cadman Committee; and last, but by no means least, the debate and statements made by Mr. Perkins and Wing-Commander Wright, in particular, in the debate, December, 1942. (See *Flight* of December 31st, 1942.)

In short, air transport should be the concern, broadly speaking, of shipping and allied industries, with the constructors divorced from financial participation, but encouraged to listen to operators' requirements before designing transport craft, and given an adequate incentive to design accordingly.

Whoever sets out to cure the ills of civil aviation will have to be strong and ruthless, because he will be up against some ruthless dictators in whose sphere of operations freedom of speech and any Atlantic Charter ideals appear to be discouraged. Good luck to him, if he comes along; he will have a wealth of support from many sources which may well surprise him when he starts, but he will have to act very quickly. Our potential position in civil aviation after this war is already in the balance and found wanting.

One word more: civil aviation cannot be run nationally, i.e., by the Government; it must be conducted by private enterprise, subsidised and supervised financially but adequately by the Government; and, as I have said before, four or five groups should be chosen to control, for example:—

(1) England and European network;
(2) England, Mediterranean, India and Australia;
(3) England to South Africa and South America;
(4) England and North America;
(5) The Far East, and connections with the West Coast of North America and Siberia, linking with (2) above;
(6) England internally.

This must be done by opening the market up sufficiently to give all competent interests freedom of speech, freedom of action, and opportunity to a fair share to serve. That, after all, is the principle for which we are all supposed to be fighting to-day.

PRIVATE AND CLUB FLYING AFTER THE WAR

(By Harold E. Perrin, C.B.E., Secretary, Royal Aero Club, 119, Piccadilly, London, W.1.)

THE Royal Aero Club, which founded the first light aircraft club and pioneered this movement, is very much concerned with the future of civil aviation. It is particularly concerned with club and private flying which are its special domain. A committee to consider this question and to make recommendations has been set up. The club feels that it would be in the interests of British aviation for the General Council of Associated Light Aeroplane Clubs to resume its functions after the war, and the time has now arrived to make plans for a nucleus of light aircraft clubs covering the immediate needs of the various areas, which would be in a position to begin operations with the minimum of delay after the cessation of hostilities.

The Royal Aero Club is also concerned with the future of private flying. One often hears it said that no one will have any money after the war to take up private flying. This is not the view of the club, which feels that, immediately after the war, there will be a large surplus of training and light communications types available for the prospective private owner with plenty of trained pilots to fly them.

Practically all the light aircraft clubs were closed down on the outbreak of war, and the addresses of their officials, most of whom are in the Services, are unknown. Should this announcement come to their notice, it is hoped that they will get into touch with the Royal Aero Club.

When this information has been gathered together and analysed, the club will be in a position to call a meeting for the purpose of submitting definite proposals to the Secretary of State for Air.

Power-Operated Gun Turrets

Boulton Paul Electro-Hydraulic System: Compactness, Simplicity and Sensitivity of Control

THE forerunner of the Boulton Paul power-operated gun turret of the present time was fitted in the nose of the Overstrand twin-engined biplane bomber. It made its first public appearance at the Royal Air Force Display at Hendon in June, 1934. That turret was operated by compressed air, and its action aroused great interest. The turret was cylindrical in shape, traversing was done by rotating the turret, while the guns were elevated and depressed through vertical slits in the turret walls. The action was smooth and quick, but the plain pneumatic system had certain disadvantages, the chief of which was that of supply. The operating period was short, and afterwards a considerable time elapsed while the air bottles were recharged from an engine-driven compressor.

A Boulton Paul four-gun (.303) turret as installed in the tail of the Handley Page Halifax four-engined bomber.

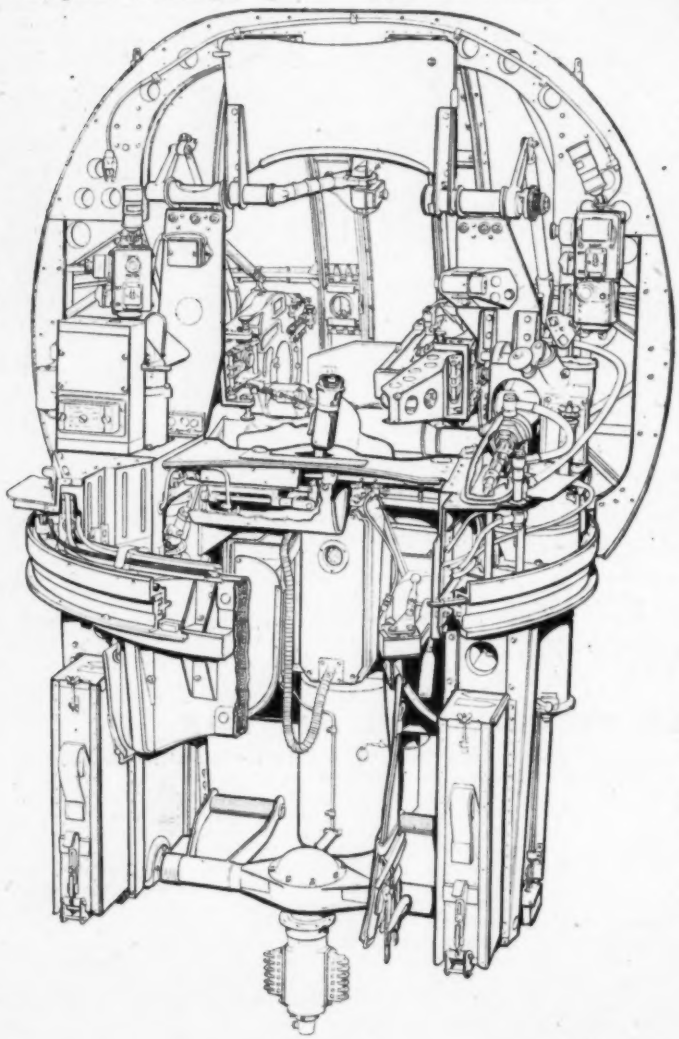
After lengthy consideration it was decided to abandon this form of operation in favour of an electro-hydraulic system. Boulton Paul, Ltd., is an offspring of the older Boulton and Paul, Ltd., having been formed as a separate company some years ago, when it took over the entire aviation department of the older firm. The company was thus in a good position when it embarked on this venture, having many years of aircraft experience behind it, and therefore being able to visualise in advance many of the requirements to meet operational needs.

Advantages of B.P. System

The electro-hydraulic system was selected for reasons of compactness and simplicity combined with sensitivity of control and response, and has a number of advantages both from operation and installation standpoints.

A most important feature in the design is that the hydraulic system is confined to the rotating portion of the turret. This avoids the difficulties of transmitting high-pressure fluid from the power source through continuously rotating joints. One trouble with using low pressures is the need for large-diameter pipes, with the associated troubles of space wastage, due to the large bend radii required.

The Boulton Paul system is claimed to avoid this trouble along with others such as pipe dilation, differential thermal expansion between



Part-sectioned view of a Boulton Paul two-gun turret of the type fitted on Lockheed Hudson aircraft.

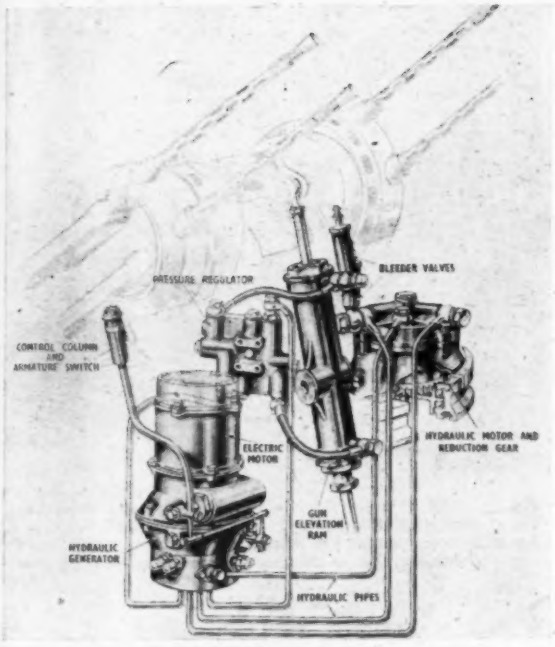


Fig. 1—A typical B.P. power control system. The control handle incorporates a "dead man's handle which, when depressed, energises the electric motor.

pipes and fluid, and leakages and fractures caused by vibration. This latter benefit results from the short pipe lengths and the ability to bend them to conform with neighbouring structure to which they can be adequately cleated.

The whole of the power units are built into the turret, leads for electric power and other services being taken to a slip ring unit on the axis of rotation, so that installation consists only of dropping the turret into position, lining up, bolting down and coupling up electrical services, and, in some cases, an external oxygen supply. The advantages of this method will be readily appreciated. All ground tests and adjustments can be made before installation in the aircraft, and the minimum time is taken in removing and replacing a damaged turret.

Operationally, an outstanding advantage is that power is only used as and when required, and there is no appreciable difference in speeds of operation either up or down wind. A brief description of turret operation will help to make these points clear The control handle incorporates a grip lever or "dead man's handle" which, when depressed, energises the electric motor, and since this operation is naturally only performed when the gunner desires to put his turret into operation, no power is consumed when the turret is idle. A typical power control system is shown in Fig. 1.

Overloading Prevented

The hydraulic generator incorporates relief valves, set to a blow-off pressure which, at full output from the generator, limits its power to that obtainable from the electric motor. There is, therefore, no danger of either the electric motor or the hydraulic generator being overloaded. Movement of the control handle imparts stroke to the generator pistons, the power output being proportional to

(*a*) the stroke imparted, which governs the speed of turret movement; and

(*b*) the pressure built up in the hydraulic system (up to maximum blow-off pressure) determined by the external resistance to turret movement.

It will be observed that for any turret speed the power output from the hydraulic generator, and consequently power input into the electric motor, is a function of turret speed and of the pressure required to overcome external resistance to turret movement at any instant—limited, of course, to the maximum determined by the setting of the blow-off valves—and the speed of the turret is virtually independent of turret movement upwind or downwind.

The foregoing outlines the general principles of the Boulton Paul system of turret operation and its main advantages, and while it is not proposed to give a fully detailed description of the whole range of turrets developed by the company, there are features associated with the various types which may be of interest.

From the diagram, Fig. 2, it will be seen that the hydraulic pumping unit (known as the generator) com-

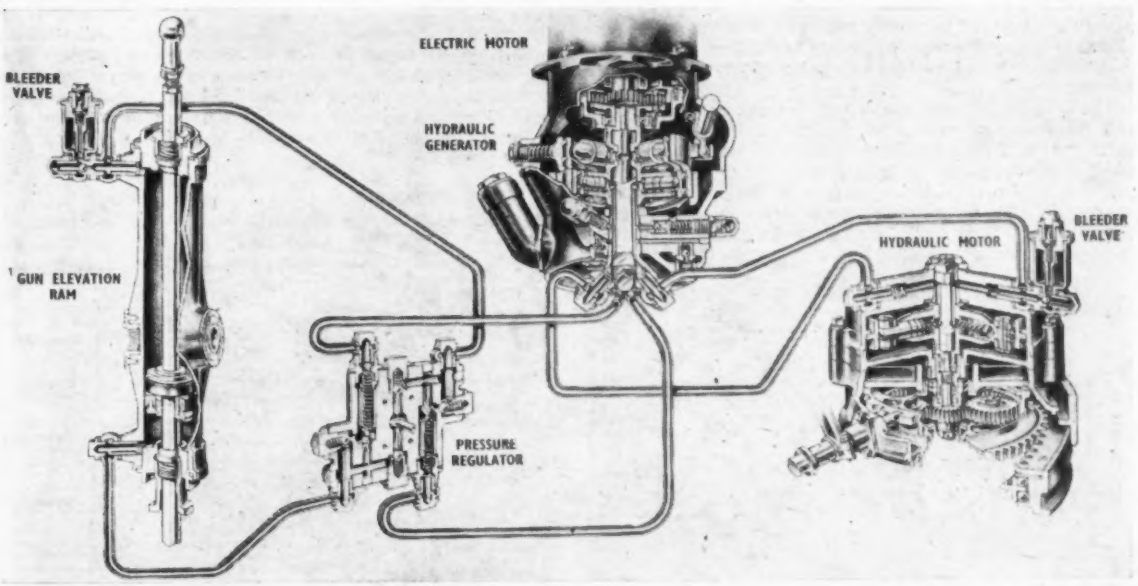
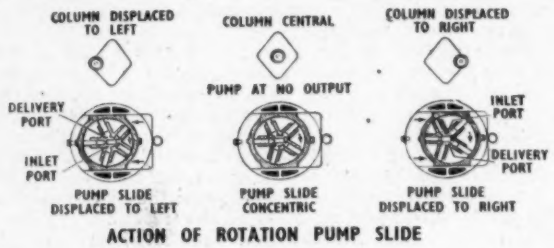
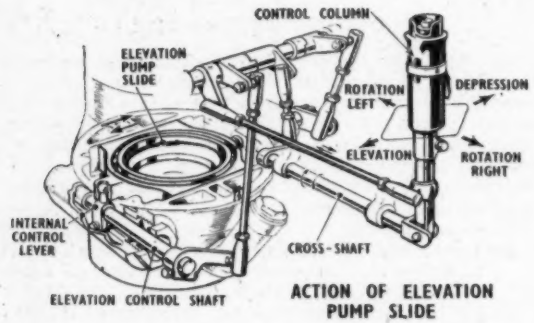


Fig. 2.—A hydraulic system representative of Boulton Paul practice. The hydraulic generator unit comprises two separate pumps, one for turret rotation and the other for elevation of the guns.

POWER-OPERATED GUN TURRETS



ACTION OF ROTATION PUMP SLIDE



ACTION OF ELEVATION PUMP SLIDE

prises two separate pumps, one of which is connected in a closed circuit to a hydraulic motor for turret rotation, while the other is connected in a similar closed circuit to a hydraulic ram for elevation and depression of the guns. A pressure regulator is interposed in the pipe lines to and from the gun elevating ram, its purpose being to provide a hydraulic lock on the guns in elevation and depression and thus prevent gun "creep."

The cylinder block of the hydraulic generator (see Fig. 3) comprises two banks of five cylinders of $\frac{9}{16}$in. bore, formed radially about the central vertical bore. The cylinder block is of phosphor bronze, and case-hardened steel pistons are used, the outer ends of which are domed and held centrifugally in engagement with a shallow groove formed in the inner race of a ball-bearing slide ring surrounding the pistons, movement of which gives stroke to the pump in either direction. The whole generator mechanism is contained in a magnesium alloy casing which also incorporates built-in make up or suction valves and adjustable blow-off valves.

The cylinder block is the driven member of the generator and rotates on a fixed steel spindle having two opposed ports for each cylinder bank. Each of the control rings slides in guides in the generator casing and has a range of movement of 0.13in. to either side of the central position concentric with the cylinder block. In operation the pistons, in addition to oscillating in their respective cylinders, have also a rotary motion due to a very slight offset of

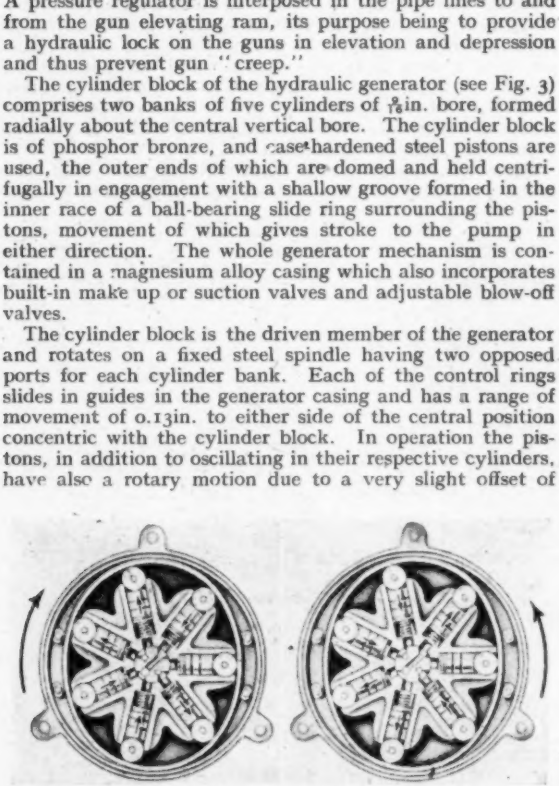


Fig. 4.—Details of the hydraulic motor, which is of the seven-cylinder, elliptical-cam type. The cylinder block is the driven member and the maximum speed about 200 r.p.m

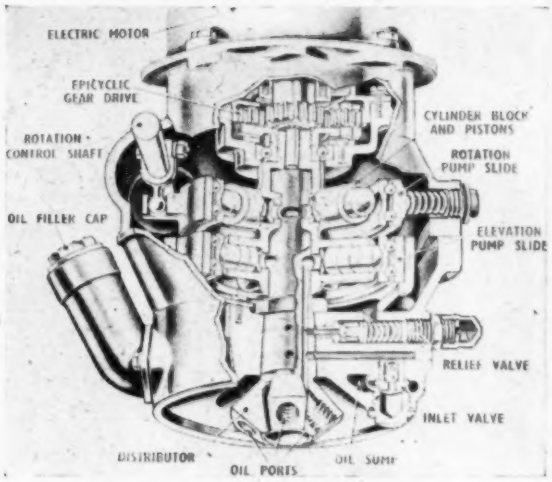


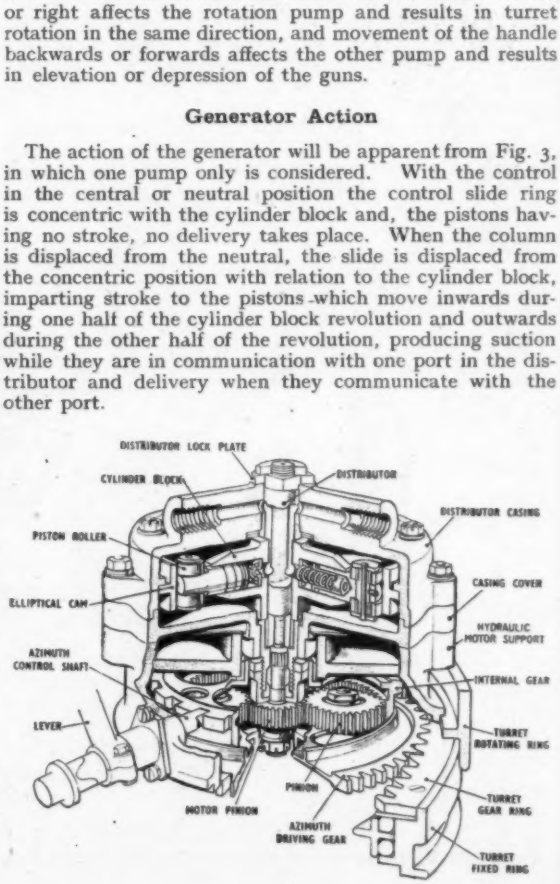
Fig. 3.—The cylinder block of the hydraulic generator has two banks of five cylinders. The outer ends of the case-hardened steel pistons are domed and held centrifugally in contact with a groove in the inner race of a ball-bearing slide ring.

the point of contact between piston crown and grooved track in the ball race. This combination of sliding and rotary motion has the effect of equalising wear and the prevention of line scoring of pistons or cylinders.

The control slides for the two pumps are connected to a control handle so that movement of the handle to left, or right affects the rotation pump and results in turret rotation in the same direction, and movement of the handle backwards or forwards affects the other pump and results in elevation or depression of the guns.

Generator Action

The action of the generator will be apparent from Fig. 3, in which one pump only is considered. With the control in the central or neutral position the control slide ring is concentric with the cylinder block and, the pistons having no stroke, no delivery takes place. When the column is displaced from the neutral, the slide is displaced from the concentric position with relation to the cylinder block, imparting stroke to the pistons which move inwards during one half of the cylinder block revolution and outwards during the other half of the revolution, producing suction while they are in communication with one port in the distributor and delivery when they communicate with the other port.



POWER-OPERATED GUN TURRETS

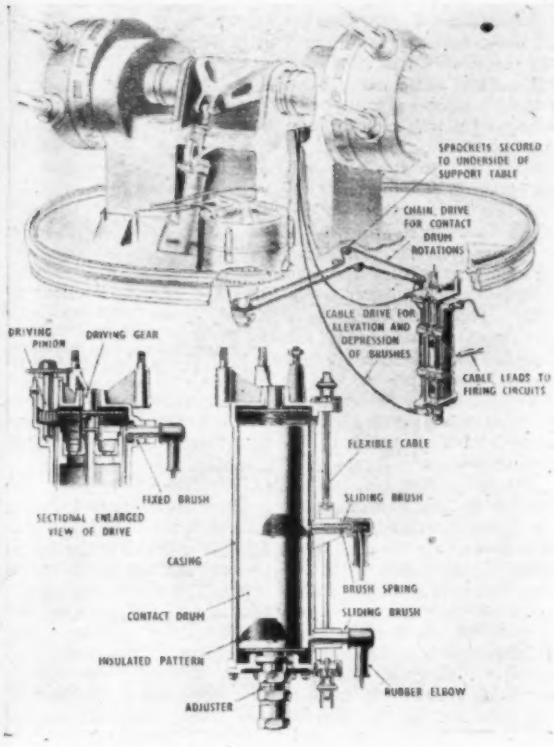


Fig. 5.—Diagram of a typical gun-fire interrupter mechanism Firing of left-hand and right-hand guns or pairs of guns is interrupted individually.

A supply of oil is carried in a sump in the generator for making up internal leakages as needed through suction valves in each circuit. Overload protection is given by blow-off valves in each line, these valves being set at pressures of approximately 1,000 lb. per square inch.

The hydraulic generator, which runs at 1,230 r.p.m., is driven by a constant-speed 24-volt electric motor running at 4,000 r.p.m., coupled through epicyclic gearing to the generator to form a single unit.

It will be understood that the two pumps are controlled independently and both azimuth and vertical traverse can take place individually or simultaneously.

The design of the hydraulic system incorporates small electric resistance heaters of approximately 50 watts loading—automatically cut out when the turret is in operation—in the hydraulic generator and motor. These heaters assist when functioning at low temperatures.

The Hydraulic Motor

The hydraulic motor (see Fig. 4) is of the seven-cylinder elliptical cam type, of ⅜in. bore and 0.45in. stroke, with the cylinder block as the driven member rotating on a stationary distributor spindle. Power strokes occur in opposite 90-deg. sectors, and the motor is reversed by reversing the supply of hydraulic fluid from the generator, determined by the position of the control handle. The materials of construction are similar to those used for the hydraulic generator, with delivery and exhaust ports formed in the distributor spindle, provision being made for adjustment of port timing by partial rotation of this spindle. The approximate maximum speed of the hydraulic motor is 200 r.p.m., and connection is made to the internally cut main driving gear through epicyclic gearing.

Gun and seat rams, where the latter are fitted, follow normal practice, the only point for comment being the construction of the piston, in which all screw joints for retaining the synthetic rubber cup washers are eliminated, the washers being retained by a "dead" spring ring and "D" washer, avoiding any tendency to squeezing out or damage to the cup washers. (See Fig. 2.)

The pressure regulator or metering valve interposed in the pipe run to gun rams serves to maintain a small back pressure on the return line, and this unit also provides a means for short-circuiting the gun ram when it is required to man-handle guns without power.

Reference to Fig. 2 will clearly indicate the operation of the hydraulic circuit, and it should be noted that the system is virtually closed, i.e., return fluid from hydraulic motor and rams is fed back to the inlet side of the hydraulic generator, and not into the pump. The make up valves function only under normal operation to permit replacement of fluid lost through interport and piston leakage, and to feed the intake side of the hydraulic generator when blow-off valves are operating.

Gun-fire Interrupter

Each gun is electrically fired by a separate solenoid, a single firing button controlling all guns being mounted in the top of the control column. A safety isolating switch is included in the circuit.

One of the first problems which had to be solved was protection for surrounding aircraft structures, such as tail, airscrews, etc., from rounds fired from the turret, without calling for any conscious effort on the part of the gunner, as it was realised that with guns spaced fairly widely apart, and not in the line of the sight, the gunner would be looking past parts of the aircraft at which his guns might actually be pointing. To overcome this difficulty an electrical fire interrupter device is fitted in the firing circuit.

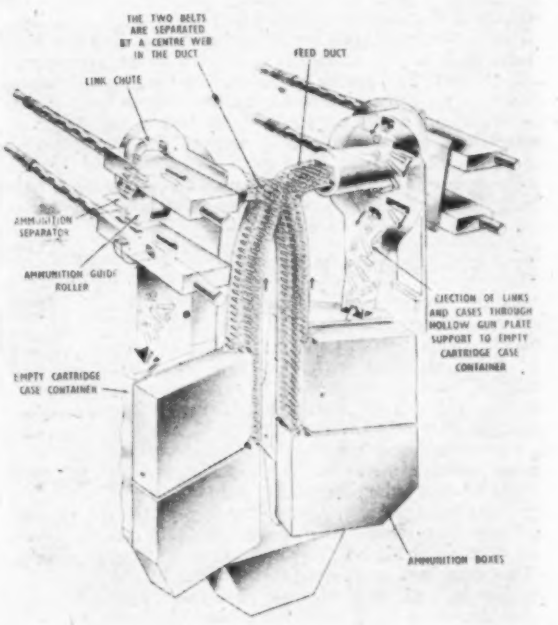

THE TWO BELTS ARE SEPARATED BY A CENTRE WEB IN THE DUCT
FEED DUCT
LINK CHUTE
AMMUNITION SEPARATOR
AMMUNITION GUIDE ROLLER
EJECTION OF LINKS AND CASES THROUGH HOLLOW GUN PLATE SUPPORT TO EMPTY CARTRIDGE CASE CONTAINER
EMPTY CARTRIDGE CASE CONTAINER
AMMUNITION BOXES

Fig. 6—A typical ammunition system as employed in most Boulton Paul power-operated gun turrets. This is of fairly normal arrangement and should be compared with the special tail turret arrangement shown on the next page.

LOCKHEED ENGINEERING LIBRARY

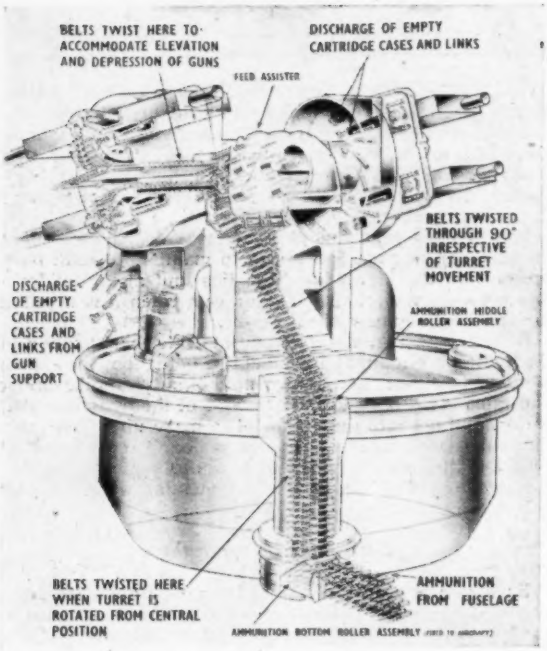

BELTS TWIST HERE TO ACCOMMODATE ELEVATION AND DEPRESSION OF GUNS
DISCHARGE OF EMPTY CARTRIDGE CASES AND LINKS
FEED ASSISTER
BELTS TWISTED THROUGH 90° IRRESPECTIVE OF TURRET MOVEMENT
DISCHARGE OF EMPTY CARTRIDGE CASES AND LINKS FROM GUN SUPPORT
AMMUNITION MIDDLE ROLLER ASSEMBLY
BELTS TWISTED HERE WHEN TURRET IS ROTATED FROM CENTRAL POSITION
AMMUNITION FROM FUSELAGE
AMMUNITION BOTTOM ROLLER ASSEMBLY

Fig. 7—In the case of tail turrets the ammunition is carried in the fuselage and led to the turret through the centre base.

POWER-OPERATED GUN TURRETS

Since the guns are spaced a considerable distance apart it is desirable to interrupt or cease the firing of left-hand and right-hand guns, or pairs of guns independently, to ensure the maximum field of fire. A diagram of a typical gun-fire interrupter mechanism is shown in Fig. 5.

The device employed for this purpose on Boulton Paul turrets consists of a brass drum rotated at the same speed as the turret. Two spring-loaded sliding brushes are located one above the other on a frame and are held in contact with the drum and arranged to slide up and down the drum surface with gun elevation and depression. Firing circuits for the left-hand and right-hand pairs of guns are fed by the upper and lower sliding brushes respectively, a fixed brush in permanent contact with the brass drum forming the other connection.

"Shadow Patterns"

On the upper half of the drum, shadow patterns corresponding with the obstructed areas of the left-hand pair of guns are cut out and filled in flush with moulded insulating material, so that in passing over these areas the upper brush is isolated and firing of the left-hand pair of guns is interrupted. In the same way the lower half of the drum surface carries similar insulated areas corresponding to the obstructed areas of the field of fire of the right-hand guns, and when the lower brush makes contact with these areas the firing circuit of the right-hand guns is broken.

Due care has, of course, to be taken in the development of these shadow patterns. This is usually done from a turret mounted in an aircraft, and allowances are made for aircraft deflections and gun characteristics. The advantage of this method of protection is that the aircraft shape, no matter how complicated, can be adequately protected with a minimum loss of field of fire.

Ammunition System

The ammunition systems generally follow normal practice (see Fig. 6), but that for tail turrets deserves special mention, as in order to minimise weight in the tail of the aircraft the ammunition is carried in the fuselage and led to the turret in steel runways or tracks, through the turret base centre, and up to the guns (see Fig. 7). This arrangement permits a greatly increased ammunition capacity. The disadvantage of this remote stowage is the inability of the gun to feed under its own power, and to overcome this a power-driven feed assister (see Fig. 8) in which the ammunition belt runs over toothed sprockets carried on a hinged arm, is direct driven through suitable gearing from the turret electric motor.

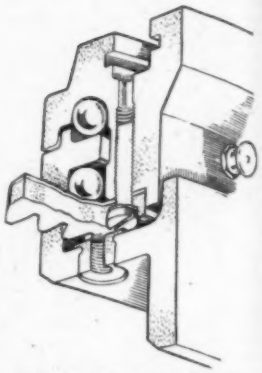


Fig. 9—The turret mounting ring comprises two machined castings forming a double-row cageless ball bearing.

Normally the belt sprockets are free, but when the tension in the ammunition belt between its feed sprocket and the gun exceeds a predetermined figure the hinged arm is actuated by the belt pull, applies a band brake to an epicyclic gear unit in the drive between the main motor and the belt sprocket and provides a power drive to the sprocket which tends to overfeed the gun. When sufficient overfeeding has taken place to reduce the tension in the ammunition belt, the hinged arm returns to its normal position and disengages the power drive. Although the description indicates a definite sequence of operations, in practice the feed mechanism is always working, the belt tension and band brake application adjusting themselves to gun requirements. Safety devices in the form of quickly replaceable shear couplings are fitted to prevent damage to ammunition belt or feed assister mechanism.

Mounting Ring

The unorthodox design of the turret mounting ring is also worth mentioning. This consists of two fully machined magnesium alloy castings assembled to form a double row cageless ball bearing. The lower row of balls takes care of down loads due to turret weight and the upper row deals with radial loads, the main driving gear being split, piston ring fashion, for assembly purposes. It will be seen that the bottom race conforms to normal ball-bearing prac-

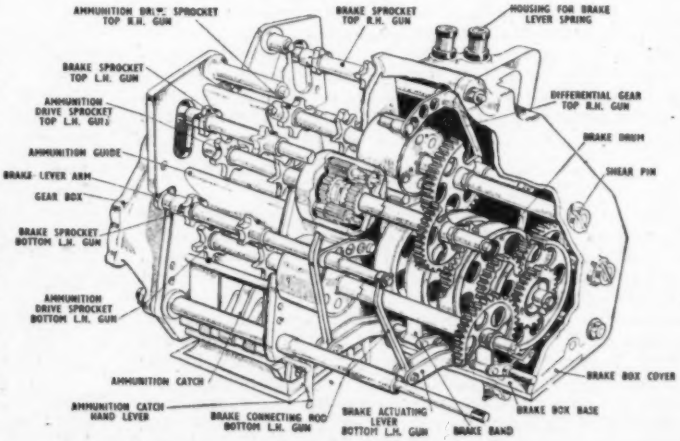

AMMUNITION DRIVE SPROCKET TOP R.H. GUN
BRAKE SPROCKET TOP R.H. GUN
HOUSING FOR BRAKE LEVER SPRING
BRAKE SPROCKET TOP L.H. GUN
AMMUNITION DRIVE SPROCKET TOP L.H. GUN
DIFFERENTIAL GEAR TOP R.H. GUN
BRAKE DRUM
AMMUNITION GUIDE
SHEAR PIN
BRAKE LEVER ARM
GEAR BOX
BRAKE SPROCKET BOTTOM L.H. GUN
AMMUNITION DRIVE SPROCKET BOTTOM L.H. GUN
AMMUNITION CATCH
BRAKE BOX COVER
AMMUNITION CATCH HAND LEVER
BRAKE CONNECTING ROD BOTTOM L.H. GUN
BRAKE ACTUATING LEVER BOTTOM L.H. GUN
BRAKE BOX BASE
BRAKE BAND

Fig. 8—With the arrangement shown in Fig. 7 the gun cannot be fed under its own power, and an ammunition feed assister is used.

POWER-OPERATED GUN TURRETS

tice, the balls running in a radiused groove in the fixed ring (Fig. 9). The track for the upper race is formed in a different manner. There is a small interference fit between the inner and outer races and the balls, the inner race is turned with a smooth finish, the outer race having fine feed tool marks left, and when assembled and run-in the balls roll a track into the ridges formed by the finishing tool.

This produces an excellent assembly free from objectionable diametrical clearance. Some surprise may be expressed at the running of steel balls on a magnesium alloy track, but tests have shown that, provided a suitable value for unit ball loading is selected, excellent results are obtained, there being no pick-up of the ball track, which actually improves with use due to work hardening of the material. Similarly, gun trunnion bearings through which the ammunition passes to the guns are of the full-ring needle-roller type running direct on to the magnesium alloy.

The representative distributor illustrated in Fig. 10 indicates general constructional features and the manner by which electrical supply and oxygen are taken to the turret.

Types of Turret

As far as types of turrets are concerned, the company has produced a wide range for nose, tail, mid-upper and under positions, two- and four-gun models. The cut-away drawing on p. 122 shows a 2×.303in. turret as installed in Lockheed Hudson aircraft, and the picture at the top of p. 122 is an external view of the 4×.303in. turret fitted in the tail of the Halifax aircraft.

In passing, it may be of interest to note that the first electro-hydraulic turret to go into quantity production was a four-gun .303-calibre model designed expressly for and in conjunction with the Boulton Paul Defiant aircraft produced by the company's aircraft division—probably the first instance of real collaboration between aircraft and aircraft armament designers.

All Boulton Paul turrets are fully equipped with auxiliary services, e.g., oxygen, inter-communication, point for connecting gunner's clothing heater plug, etc., and reference to the illustration on p. 122 will indicate the layout of items of equipment.

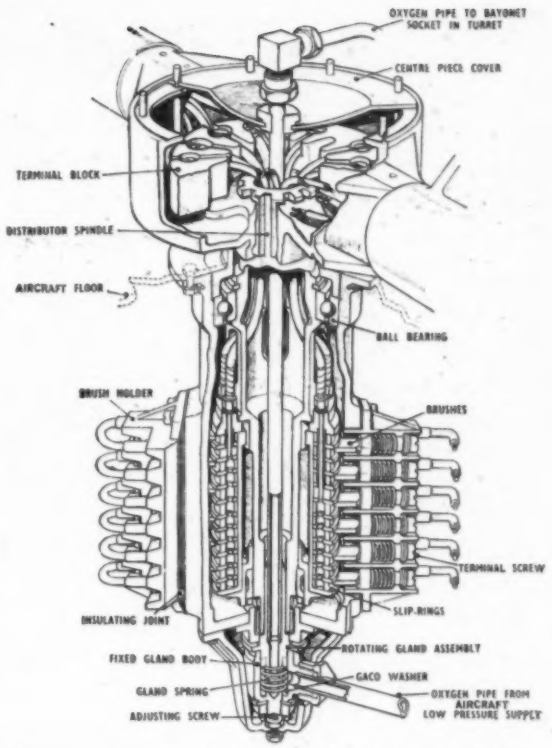


Fig. 10—Part-sectioned view of a distributor unit through which electrical supply and oxygen are taken to the turret.

Among aircraft—British and American—fitted with Boulton Paul turrets may be mentioned the following:—Defiant, 4×.303in. mid-upper; Halifax, 2×.303in. nose, 2×.303in. mid-upper, 4×.303in. tail; Lockheed Hudson, 2×.303in. mid-upper; Ventura, 4×.303in. mid-upper; Liberator, 4×.303in. mid-upper, 4×.303in. tail, all of which have proved so highly successful in service with the R.A.F.

PRESIDENT OF I.A.S.

DR. HUGH L. DRYDEN, of the National Bureau of Standards, Washington, D.C., has been elected president of the Institute of the Aeronautical Sciences for the year 1943. As the eleventh president of the Institute, he succeeds Hall L. Hibbard, vice president and chief engineer of Lockheed Aircraft Corporation, Burbank, Calif.

Dr. Dryden's work as a physicist during the past twenty-four years on the staff of the National Bureau of Standards, where he is chief of the Mechanics and Sound Division, has produced many important developments in the sciences on which progress in aviation is based. He has been concerned chiefly with fundamental research in aerodynamics and hydrodynamics, and has supervised the research done at the Bureau on aircraft structures and aircraft instruments.

The Institute of the Aeronautical Sciences has previously honoured Dr. Dryden, who is an honorary fellow of the organisation, by choosing him to deliver its annual Wright Brothers lecture in 1938, which was on the subject "Turbulence and the Boundary Layer." He was also named as recipient of the Sylvanus Albert Reed award in 1940 for his notable contributions to the aeronautical sciences made through studies on the mechanics of boundary layer flow and the interpretation of wind tunnel experiments. His achievements in this highly technical field have greatly increased the accuracy of wind tunnel tests on aircraft models.

Dr. Dryden has written numerous scientific reports and papers published by the Bureau of Standards, the National Advisory Committee for Aeronautics, and technical journals. Since September, 1941, he has served as editor of the "Journal of the Aeronautical Sciences," published by the Institute of the Aeronautical Sciences. He is an Associate Fellow of the Royal Aeronautical Society.

AIRCRAFT RECOGNITION CHARTS

THE *Flight* Recognition Charts of British, American and German aircraft have again been modernised and are now available printed on paper in a larger size, each measuring 29×19in. The price of the set of three charts in envelope is 2s., by post 2s. 2d. Copies of these charts are also available mounted on card, varnished, eyeletted and corded, at the price of 2s. 6d. each, by post 3s. Ordered together the cost of the three mounted charts, with postage, would be 8s. 2d.

A.T.A. BENEVOLENT FUND

DONATIONS to the A.T.A. Benevolent Fund continue to be received by the treasurer of the Fund at White Waltham, near Maidenhead, Berks.

	£	s.	d.
Subscriptions already acknowledged ..	5,267	9	5
The de Havilland Aircraft Co.	105	0	0
Rubery, Owen, Messier, Ltd.	10	10	0
F. W. Ellis, Esq.	5	0	0
Sieff and Beaumont, Ltd.	3	3	0
T. D. Whitfield and Sons	3	3	0
Hallam, Sleigh and Cheston	2	2	0
Mollart Engineering Co.	2	2	0
Imperial Chemical Industries, Ltd.	1	0	0
	£5,399	9	5

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Industrial Dictatorship

TOWARDS the end of December, the Japanese Cabinet approved a draft legislation for the "Wartime administration of special cases." Apparently all is not well with the Japanese industry, for the new law is to enable the Government to improve production capacity and to intervene directly in the production process without reference to existing institutions or Government Departments.

While gradually the control of the industry is shifting from the big families to the Government, the legislation is also designed to give dictatorial powers to the *Tenno*. Since the reading of the draft in the Chamber of Deputies is, in Japan, merely a formality, it can be already assumed that in future the entire direction of the industry will be controlled by their Prime Minister.

It is significant that the new legislation refers specially to measures designed to increase the production of steel, iron and light metals for the shipping and the aircraft industries.

Luftwaffe reconnaissance units operating in battle of Stalingrad were equipped with the Focke-Wulf Fw 189. The aircraft, powered with two Argus As 410 engines of 450 h.p. each and driving two-bladed Argus automatic c.p. airscrews, develops a speed of 221 m.p.h. at 8,530ft. It climbs to 6,560ft. in 4 min. and has a service ceiling of 27,550ft.

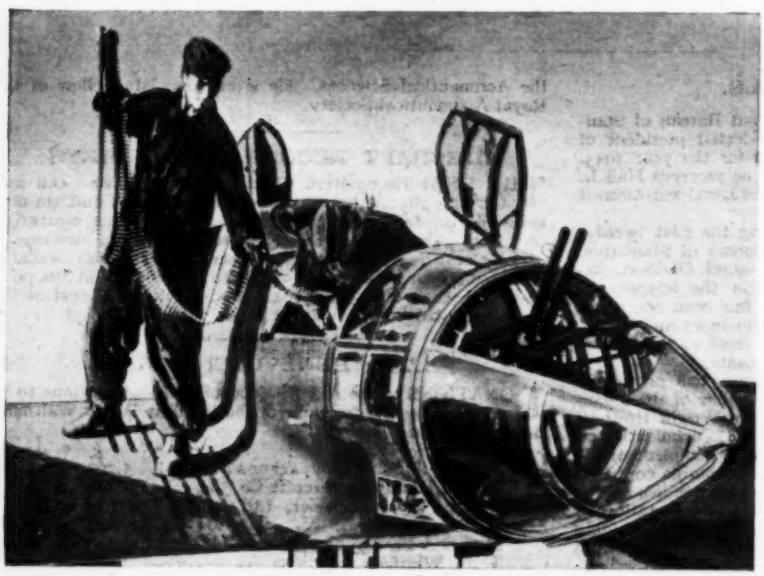
A Stuka Tale

THE screen put up around the German people to make them believe that everything is "according to plan" includes fragments of reports of *Luftwaffe* activities on the Eastern front. In place of the customary references of air support given to ground forces, the German Press publishes dramatic descriptions of such operations. Here is a sample:—

"At 4 a.m. comes the call 'Flying personnel ready!' Twenty-three aircraft take off. The Stukas reach the front. Suddenly, A.A. fire everywhere. Visibility is bad over the target area. We keep circling one behind another. Finally, we reach a forest in German hands. The Russians are already beginning their attacks, and this is what we have been sent there for. A Stuka attacks from 2,000 m. Order: 'Tiger I to all Tigers: drop your bombs singly! Then two gunning raids. Look out for German infantry!'

"Diving, to me, is just the same as taking off or landing—quite mechanical," says the Stuka pilot. "Even at 80 deg. I do not look at the altimeter or the warning signal lamp at all—I rely on my feelings, not only instruments. While diving, I look at the enemy tank which is trying to escape at full speed, also at the aircraft before me, which I must not overtake. I pull the machine up, and it rapidly gains height again. The tank has been destroyed. Yet another dive. The bomb drops into a group of Soviet riflemen. Terrible effect. It is all to the good that the noise of the engine is louder than anything else.

"Tiger IV to Tiger I: 'Gustav shot down by A.A. fire.' That means that Hans and Paul have been killed."



A close-up view of the modified gun position of the Fw 189: the single machine-gun in the nacelle tail-cone has been replaced by twin guns. The armament of the Fw 189 includes also two fixed machine-guns under the nose of the nacelle, a flexible gun mounted in a cupola on top of the nacelle and four small-calibre bombs underneath wings.

Raw Material

ACCORDING to reports from Germany, researches carried out in that country for the extraction of cellulose from wood of poplar trees have been successfully concluded. The amount of cellulose extracted from this wood is said to be higher than yields obtained from any other tree growing in Germany.

Vichy Lubricated

IN December, 1940, a collection of salvaged lubricants was instituted throughout Vichy France. It is now reported that, by a process of refining, 8,300 tons of useful lubricant have been reclaimed up to date.

Fighter Station's Veteran C.O.

A PILOT who in the last war fell out of his aircraft without a parachute—and got back again—and in this war has flown a Hurricane at first attempt, has just been given command of a Fighter Command front-line station in South-East England. He is Wing Commander Louis Arbon Strange, D.S.O., D.F.C. and Bar, M.C., who retired soon after the last war as a lieutenant-colonel and rejoined the R.A.F. in 1938 as an acting pilot-officer.

Wing Commander Strange was chasing a member of Von Leutzer's squadron on May 10, 1915, when his ammunition gave out and his Lewis drum jammed. Gripping the control-stick with both knees he stood on his seat and tugged at the drum with both hands, but his safety belt must have slipped, because when the Martynside, which he was flying, stalled and flicked over into a spin he was thrown out of the cockpit.

He managed to hang on to the centre section strut below the Lewis and, with the machine flying upside down, kicked up behind him and managed to get his feet inside the cockpit. Somehow he grabbed the control-stick with his legs again and jammed on full aileron and elevator. The machine came over right way up and he fell back into his seat with a bump.

By chance the station where he now commands is the same one at which he landed to refuel with the first British squadron to fly in formation to France in September, 1915. His squadron commander on that occasion was the former R.A.F. Chief of Staff, Sir Cyril Newall. One of Wing Commander Strange's squadrons has already destroyed 63 enemy aircraft and damaged or probably destroyed as many again.

Wing Commander Strange was a pioneer and exponent of gunnery in aerial warfare. A Henri Farman biplane was the first aircraft to be fitted with a Lewis gun on a mounting of his own design. He experimented with petrol bombs, the forerunner of the present fire bombs, and he was the originator of "leaflet raids," for he dropped French news bulletins on occupied parts of France.

Lieutenant-Colonel Strange, as he was then, saw the initial gas attack on Ypres on April 22, 1915. While on reconnaissance he noticed streams of yellow-green smoke billowing towards the British lines, and remembering the discredited story of a German prisoner who hinted at gas attack, he flew back to warn General Plumer.

Between the two wars he concentrated his organising skill on civil aviation development, and with the young American, Whitney Straight (now an Air Commodore in the Middle East), he developed several internal airlines and flying clubs.

When he rejoined the R.A.F. he persistently demanded a flying job, and eventually was tested in a Tiger Moth by a young pilot whose father's flying licence was certified by the Wing Commander himself.

In France, May, 1940, Wing Commander, then Pilot Officer, Strange was ordered to bring back a serviceable Hurricane. Although he had never previously flown an aircraft of this type he took off and "hedge-hopped" across France, pursued by Messerschmitts. For this he was awarded a bar to his D.F.C., 22 years after the original award.

In 1941 he helped to train parachute troops and glider pilots. Now the man who has flown in both wars fittingly takes up the challenge on yet another front.

To round off the picture of the flying career of this pioneer British pilot it may be of interest to the younger generation, and revive happy memories among our older readers, if we recall that Louis Strange learnt to fly at the W. H. Ewen school at Hendon. He "took his ticket" in August, 1913, on a little Caudron biplane driven by an Anzani air-cooled engine of only 35 h.p. *Flight* of August 16th, 1913, recorded the event in the following words: "Mr. L. A. Strange then went through his *brevet* tests, flying steadily, rising to 300ft. and landing on the mark." Strange later joined the Grahame White school, where he became an instructor.

On the outbreak of war in August, 1914 Louis Strange joined the Royal Flying Corps, and he evidently did not lose much time getting into his stride, for in our issue of December 25th, 1914, we published the following reference, in a paragraph giving news of old Hendon pilots: "L. A. Strange is said to have been particularly active in bringing down German aeroplanes, and has, I am told, sent home as a trophy the altimeter from one of the German machines that he had brought down."

Wing Cdr. Louis Arbon Strange leaving Buckingham Palace after receiving a Bar to his D.F.C.

"Flight" photograph.

Lt.-Col. L. A. Strange with Mr. Whitney Straight (now Air Commodore) who were associated in airport and civil flying ventures from 1936 onwards.

"Flight" photograph.

Louis Strange standing by the tail of a Grahame White box kite which he used to fly in 1913.

Sandor Synchrophone

Mechanical Complexities Explained by Sound and Pictures : A Training System Which Anyone Can Operate

A DEVICE with almost unlimited applications has been developed during the last couple of years by Mr. N. Sandor, managing director of I.S.M., Ltd., of 25, Haymarket, London, S.W.1. Mr. Sandor has given to his invention the name Synchrophone Training Picture, or Synchrophone for short. It comprises two units, a sound unit which resembles an ordinary radiogram, and which plays 12in. gramophone records of the lecture it is desired to give; and the picture unit, which is a frame containing one or more illustrations of the subject of the particular lecture.

The Synchrophone picture frame measures 3ft. by 2ft. and is about 9in. deep. Mounted on the front glass panel is a translucent picture of the subject, and behind the picture is an array of small electric bulbs, so screened from each other that small individual areas of the picture can be illuminated while the rest of the picture is in darkness. The object of this arrangement is, of course, to enable emphasis to be laid, during the lecture, on any particular detail of the mechanism that is being explained. When desired, the whole picture can, of course, be illuminated at once.

Electrical connection between sound unit and picture unit ensures synchronisation. Thus, if the subject being explained is a complicated mechanism, the individual small components of the mechanism can be brilliantly lighted at the moment when it is mentioned in the gramophone lecture. As the lecture proceeds to the next piece of mechanism, the previous one disappears from the picture and the new one is lighted up, and so on until the mechanism has been explained piece by piece and the whole complete object built up.

The Sandor Synchrophone equipment. The particular picture shown is used to illustrate the use and care of cutters in machining operations.

"Silent" Pictures at Will

The Synchrophone can, however, be used just as easily in a different way. The picture unit can be operated by itself, without the sound unit, and a push button switching arrangement enables the sequence of illuminated small components to be run through in its proper sequence. It is even possible to switch back to any particular small components the action of which was not understood at the first showing.

Where the Synchrophone scores over the ordinary film is that any particular picture can be held for as long as the student desires. There is nothing to catch fire by such a stoppage! Moreover, it is not necessary to use the device in a darkened room since the illumination behind the coloured pictures is powerful enough to make them clearly visible in a room in broad daylight. In that respect, therefore, the Synchrophone equipment has much wider scope than, for example, lantern slide shows or projection by epidiascopes.

Operation of the Synchrophone is simplicity itself. All that is necessary is to plug the lead into any convenient wall or lamp socket and switch on, starting the sound unit exactly as one starts a gramophone. Thus a student who failed to understand the subject fully at the first run can go through it again without aid, can stop at any point while closely studying the particular detail which puzzles him, and then go on again to the next. The size and weight of the outfit are such that it can be easily transported in a car.

We have followed Mr. Sandor's development of the Synchrophone with a good deal of interest, and we can, perhaps, claim a very small share in the credit because his first attempt took the form of a *Flight* drawing by Mr. M. A. Millar of the Short Sunderland flying boat. The Synchrophone record was used to explain the equipment and components of that aircraft, and the coloured picture was illuminated piece by piece to show the location.

Considerable development work has, however, been done since those days, and the result of some two years' experience has been a vast improvement in what may be termed the technique of the device. One important improvement relates to a system of mounting small pictures behind the glass of the frame in such a way that mechanical movement can be shown by switching. It is not, of course, the movement of the cine film, but rather movement conveyed by showing a particular mechanism in two or three positions, chosen to illustrate the important phases of the movement.

So far as the aviation world is concerned, there are numerous applications of the Synchrophone. It can be used in works and factories to explain the working of tools. For students it can give "lectures" on the operation of details of the aircraft engine. We can, for instance, visualise the working of a sleeve valve, with the sleeves moving up and down, opening and closing the ports, and the piston at the same time travelling up and down inside the sleeve.

Many other applications will readily suggest themselves. For instance, the subject of aircraft recognition could be dealt with in a most interesting way, and Mr. Sandor has, in fact, already made an experimental frame of pictures which, although not perfect, does afford an indication of what can be done in that direction.

Used by the Services

In view of its versatility it is hardly surprising to learn that the Synchrophone has already become extensively used for training purposes in the Army, Navy and R.A.F., as well as in a number of munitions factories. Training time is an important consideration nowadays, and experience has shown that it can be materially reduced by the judicious use of this simple "mechanical teacher," although it is not, of course, intended to replace, but rather to supplement, the human instructor. One great advantage is that those who are somewhat slow to learn can repeat the lecture as often as desired until understanding dawns, can slow down the rate of showing, stop at any point, or go back to some particularly puzzling feature of a mechanism.

Although the Synchrophone was designed in wartime, and for the express purpose of speeding-up and facilitating training, it is not difficult to foresee many post-war applications to commerce and trade. The fact that the same picture can be used with gramophone records in any language appears to hold out promise of great commercial possibilities in connection with export.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"UNSUNG WORTHIES"

The Men Who "Keep 'em Flying"

I READ with interest in the *Flight* issue dated January 14th your reference, under the above title, to the "unadorned" tradesmen of the R.A.F. who, to put it briefly, keep 'em flying.

Why is it, I wonder, that these men, in whose hands rest the lives of our aircrews, are not given a badge in recognition of their trade and responsibility? I am sure that a great majority of the public wish, as I do, to see these men receive the recognition that has long been due to them. H. B.

FIGHTER SPEEDS

S.6B Exceeded 400 m.p.h. 12 Years Ago

ON September 29th, 1931, a Supermarine S.6B won the Schneider Trophy outright for Great Britain with an average speed of 407.5 m.p.h. It had a 2,600 h.p. Rolls-Royce "R" engine, which drove a two-bladed airscrew. Since that impressive victory nearly twelve years have passed, and aircraft are claimed to be further advanced.

But is this so? The maximum speeds of aircraft nowadays, whether friend or foe, are below 400 m.p.h. unless subjected to power dives. The only exception to this, so far as is known, is the Typhoon. What is the reason for the reduction in speed over the last twelve years? Why was the Spitfire, for instance, only equipped with a 1,030 h.p. engine? You might argue and say the fighters of to-day have to carry guns and ammunition, armour plating, extra fuel, etc. But think of the colossal drag set up by the large floats as carried by the S.6B. Also remember that the S.6B only had a two-bladed airscrew, whereas the modern fighter has at least a three-bladed and sometimes four-bladed airscrew, which puts the S.6B at a decided disadvantage.

Can any reader please enlighten me as to why the speeds of modern day fighters are inferior to that of the S.6B of 1931?

C. G. WILLEY.

POST-WAR AIR-MINDEDNESS

Light Aircraft for the Sportsman

I WAS glad to read "Moth's" letter, considering the post-war outlook of the private pilot. As a young R.A.F. officer said to me, the light aircraft reveals the most fascinating aspect of flying. Liners, except in mountainous country, are apt to be dull; you can watch people munching or dozing as in trains! And fast war-type machines cater for performance, not pleasure. Flying a light aircraft just as and where one likes is the sport at its best. He was right.

The machine required is a covered one; an open aircraft is too cold at over 13,000ft. in the Alps. Its ceiling for European mountains will be 17,500-18,500ft., at which level no oxygen tube will be needed for healthy folk. I have read much about the uses of oxygen, but I recall that mountaineers, even when struggling hard up Mt. Blanc or Mt. Elbruz (Caucasus), dispense with this luxury. Many also dispense with special heavy garments. Similarly, during many years of air adventures I found my ordinary lounge suit quite comfortable (I don't possess an overcoat), e.g., when photographing, through an open window, the highest Alpine peaks. Let no amateur, with robust heart and lungs, be dissuaded from doing like things. There's no call for Eskimo clothes in the Alps. I eliminate, thus, all that makes for discomforting weight, including a parachute, and am able to "fly at caprice" with maximum pleasure.

The machine, touring at 120 m.p.h., will allow one to leave Berne in the morning and have tea in London. What more is needed?

Now, I believe that a machine of this kind, of the "cheap and safe" order desired by "Moth," will be available, if the de Havilland Co. carries through intentions interrupted by the war. I refer to the two-seater Moth Minor monoplane. The Gipsy Minor engine of 90 h.p. suffices well, and may it turn out as admirable a possession as the Gipsy Major! I found this aircraft very easy to fly and land, but had no opportunity of determining its ceiling in the high places where this is important. I flew an open aircraft, but was told that the coupé one contemplated would be an even better mount and faster.

Finally, let me advise all intending flyers to ignore the talk about aerial sport being a "young man's job." Your medico will tell you best whose job it is. I learnt my aerobatics at 71 and am allowed by the doctor 20 years' more fun, if I so desire. So that's that. "AVIATOR."

RAID ON STONELESS

Village Said Not to Exist

MAY I be allowed to draw your attention to an error in your issue of December 31st? I refer to the statement that the village of Stoneless claimed to have been bombed by the enemy does not exist. Reference to any large-scale map of East Kent will reveal that this village, consisting of one public-house and two private houses, is situated on the main Sandwich-Ramsgate road, approximately equidistant from these two spots. At this point a secondary road branches from the main road and leads to Minster. P. ADKINS.

[The statement was made in an official news item issued by the Air Ministry; the German radio, they said, reported a raid on "Stonesless."—ED.]

BOOST PRESSURE VARIATION

Maintained Increase After Diving

I HAVE followed with considerable interest the recent correspondence on the subject of boost pressure variation. Mr. Young's clear and concise explanation in your issue of January 14th appears to hit the nail on the head for the first time.

Not long ago I was discussing this phenomenon with a Rolls-Royce representative, and his explanation corresponded almost word for word with Mr. Young's.

While on the subject of Merlin engines and boost variation, there is another rather similar phenomenon which many readers have probably noticed.

If an aircraft is put into a dive on predetermined r.p.m. and boost, the boost will rise steadily in the course of the descent, and on flattening out it will remain at a new higher level, although the cockpit throttle setting is the same as at the start of the dive. I have always assumed this to be due to the increase of air density as the aircraft loses height, but possibly readers may have other interesting views on the subject. I am assuming, of course, that a constant-speed airscrew is fitted.

"HURRI."

AERONAUTICAL UNIVERSITIES

The Voice of the Coming Generation

AS one very keen exponent of civil aviation, in all its aspects, I salute Mr. F. G. Miles for his inspired article—"The Air and the Commonwealth—Now!"

I have, however, only one regret, and that is, assuming that his article was published only in *Flight*, and even if in all the other aeronautical journals, it would only reach those who are already aware of the pressing needs of our country, in the sphere of aviation.

I would like to agitate for the publication of this article in pamphlet form. I would place one of these leaflets on every seat in both Houses of Parliament. Of the remainder, I would distribute them freely among the public. I was going to suggest underlining, in red ink, the vital items; but, on reading the article again, I realised that the entire article would require to be underlined.

In order to reach every intelligent citizen, I would ask every newspaper company to reprint the article in a very prominent position in their papers.

I also believe that great benefit would be wrought if Mr. Miles himself would give a very strong, frank and urgent heart-to-heart talk to all Britons in the postscript to the "Nine O'clock News" some Sunday in the not-too-distant future.

There is, unfortunately, one point which I should like to dispute with Mr. Miles, and that is the small sentence, "Find the students." There is no need to look for us. We have been waiting for years for such a glorious opportunity. Unfortunately, being scattered all over the Commonwealth, we cannot unite enough to make ourselves heard.

CORRESPONDENCE

We look, therefore, to people like Mr. Miles and many others to give us a helping hand. These people, by means of their positions or reputations, are our only means of entry into those influential quarters through which it is necessary to pass before the wheels of governmental machinery can be set in motion. There are, of course, many rusty elements of this machinery which will have to be overcome.

We must "bind" and "bind" until something is, at long last, done. And we will tolerate no half-hearted compromises.

Most of us are on flying duties against the common enemy just now, and many of our number have already lost their lives, because of our conviction of the power of aircraft in war as well as in peace.

We therefore demand that our country repay our sacrifices, on their behalf, by giving us the largest and most efficient airline system in the world—*not* for our own personal gain, but because we believe it is for the benefit of the commonweal, through the integrity of our Commonwealth—"our way of life."

You will have to make that university "plenty big," for we are coming in our thousands! EAGER BEAVER.

No Facilities for Ambitious Students

MR. F. G. MILES advocates, in an article in *Flight* for January 21st, the building of an aeronautical university "far more dynamic and ambitious than anything heretofore considered."

I am a university student whose ambition it is to become an aeronautical engineer. Yet, despite the increased importance of the science of aeronautics in wartime, there are no special facilities for studying this particular branch of engineering. On the contrary, the only university aeronautical engineering degree—that of B.Sc. (Aeronautics) of the University of London—has now been scrapped. The Board of Education State Bursary scheme included at one time training in aeronautical engineering. Yet when I applied for a bursary in this branch last summer I was informed that the board had decided not to offer that year any bursaries in aeronautical engineering. I am therefore studying mechanical engineering, as this is the best training I can have in the circumstances. I feel very keenly this absence of specialised aeronautical training, as I am not nearly as interested in civil or mechanical engineering. I therefore heartily endorse Mr. Miles in his suggestion. His whole article is vigorous, forthright, and inspiring. S. W. GREENWOOD.

UNNECESSARY SECRECY

Aircraft Everyone Already Knows About

I AM in full agreement with your correspondent Mr. Henderson (*Flight*, Jan. 7th) concerning the Typhoon. The number of people in this country who have either seen or know what this machine looks like must be well over a million, and when one considers the time it has been in production and service it is hard to see why it should be still on the Secret List.

Then there is our "new torpedo-bomber." When are we to be allowed to know something about that? There is also a certain twin-engined bomber which is quite as old as the Stirling, etc., which, owing to the fact that it was underpowered, never went on operations. As the Germans have not shot any down they are presumably supposed not to know anything about it! This machine is not likely to be used against them, so surely there would be no harm in letting them know what it looks like and in our knowing that it exists?

Then again, we have the York; its existence is no longer a secret and, as it is a transport, why no photographs and details of it yet?

When will the Air Ministry realise that, as in the case of the Whirlwind, after a certain lapse of time there is bound to be a considerable passing round of information, and that the "secret" machine is a secret no longer. G. WATTS.

Book Reviews

The Use of Air Power. By Flt. Lt. V. E. R. Blunt, M.A., LL.B. Thorsons Publishers, Ltd. 8s. 6d.

THIS is not an easy book to read. Although the author is liberal in his use of tables, of headings and of sub-headings, it is not always easy to grasp his meaning or follow his train of thought. At the end, the reader is left in doubt about the mental picture which the author has put before him of the ideally best arrangement of British Fighting Services. On page 117 he writes that "there is neither a sound logical reason, nor a sound practical reason, for the Independent Air Force." Most emphatically do we disagree. In other places he advises unity of command and one Commander in Chief over all three Services. We agree; and so do the authorities who placed first General Wavell and then General MacArthur in that position in the South-West Pacific, General Eisenhower in French Africa, a British Admiral in Ceylon, and Admiral Lord Louis Mountbatten over Combined Operations in Great Britain.

The author's chapter on "Air Commandos" leaves us mystified. When he says that "the whole of the Air Force training" would need to be redirected in favour of combative training, in order to seize airfields, we must ask if the training of aircraftmen, such as fitters and riggers, is not already sufficiently exacting? Surely the present system of using soldiers as air-borne troops is much wiser. And is it a fact that Air Force officers have experience (experience in tactics must be meant) of the two other Services?

The author has some sound ideas. He believes that bombing will not destroy the *moral* of a great nation. He realises that bombing ought always to be directed upon targets of immediately urgent importance. He insists that air superiority is not an end in itself, but a means to an end. He stresses the uncertainty of precision bombing. He allows that the most which can be claimed for air attack on production is that it can "soften" the resistance of the enemy. These ideas are not original, and we believe that the Air Staff would assent to them. Yet it is useful to state them, because so many of the public have been led to think otherwise.

There are numerous points in the book on which discussion and disagreement are possible, e.g., the use of carriers, the use of fighters (as apart from fighter-bombers) to attack ground troops, and the purpose of R.A.F. sweeps over France. There is no space to discuss them all, but we must end by pointing out that the author has overlooked the basic superiority of short-range fighters over long-range fighters, and that that has led him into some fallacious deductions. F. A. R.

"A First Course in Wireless." By "Decibel." Sir Isaac Pitman and Sons, Ltd., London. 5s.

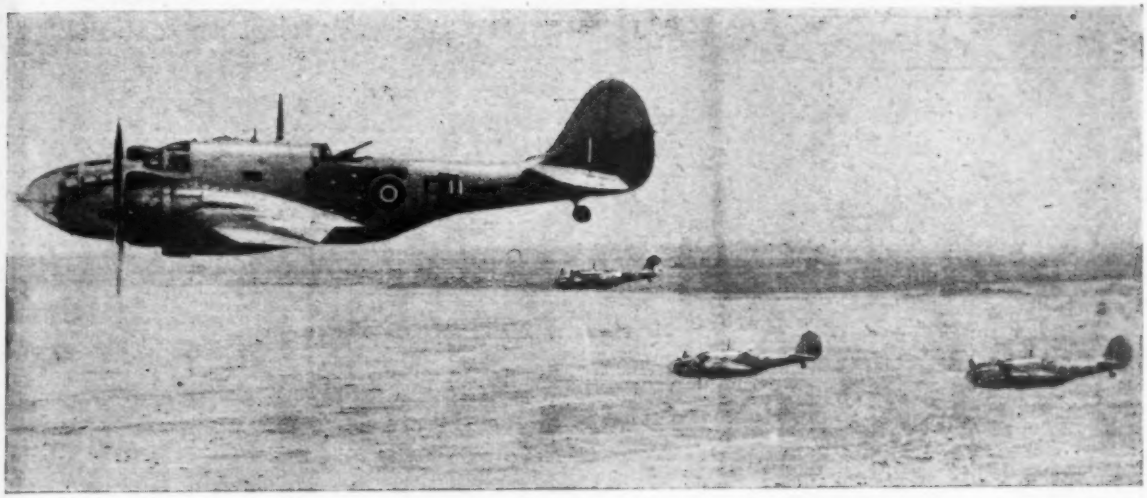
THOSE seeking for the first time information on the theory and practice of wireless while possessing little or no technical knowledge could not do better than study this excellent introduction to the subject. Written especially for this class of student, it is most highly recommended.

"The Observer's Handbook on Aircraft Instruments," by W. J. D. Allen. George Allen and Unwin, Ltd. 2s. 6d.

THIS small book by no means exhausts the subject, but it contains just over 100 pages of valuable information on the modern compass, gyroscopes, a range of pressure instruments and the drift recorder. There are few books on the subject and this is certainly a useful contribution in handy pocket size for those who wish to understand the fundamental principles of aircraft instruments.

"From Birds to Aeroplanes," by T. L. Bartlett, B.A. The Royal Society for the Protection of Birds. 6d.

NOBODY interested in flight can be indifferent to the fascination of birds, and this little booklet deals with its subject in appealing fashion. It contains a great deal of interesting information about the structural features of a bird's body and wings, and about the flying habits and relative efficiency of various types. Incidentally, bird spotting appears to be even more tricky than aircraft recognition.



MARTIN BALTIMORES IN FORMATION OVER THE DESERT : The completely transparent nose gives the navigator/bomb-aimer excellent view.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

BAR TO DISTINGUISHED SERVICE ORDER.

Sqn. Ldr. T. M. BULLOCH, D.S.O., D.F.C., No. 120 Sqn.—F/O. Layton and Sgts. McColl and Turner were navigator, flight engineer and wireless operator respectively of an aircraft captained by Sqn. Ldr. Bulloch and detailed for convoy escort duty in December, 1942. During the flight eight submarines were sighted, of which one was almost certainly destroyed. Six more were skilfully prevented from making any attack on the convoy. Throughout the sortie, which necessitated some 16 hours' flying, Sqn. Ldr. Bulloch, splendidly supported by his colleagues, displayed outstanding determination and unswerving devotion to duty.

DISTINGUISHED SERVICE ORDER.

F/O. M. S. LAYTON, R.C.A.F., No. 120 Sqn.—For citation see Sqn. Ldr. Bulloch, D.S.O., D.F.C.

Act. Wing Cdr. P. H. CRIBB, D.F.C., No. 35 Sqn.—This officer has an outstanding record as a captain of aircraft, and has displayed exceptional qualities of leadership in many sorties against the enemy. He has attacked his targets with unfailing regularity and accuracy.

Act. Wing Cdr. V. H. P. LYNHAM, No. 279 Sqn.—Since its formation in 1941, Wing Cdr. Lynham has commanded No. 279 Sqn. This officer has trained many crews for day and night search operations, and they have been directly responsible for the successful rescue of 55 members of aircrews and 23 seamen, often despite enemy opposition.

Sqn. Ldr. G. H. WOMERSLEY, No. 156 Sqn.—Sqn. Ldr. Womersley has participated in many successful attacks. Even when damage has been sustained by his aircraft, he has completed his mission undeterred.

Act. Sqn. Ldr. T. G. MAHADDIE, No. 7 Sqn.—This officer has consistently attacked heavily defended targets with coolness and determination, often in adverse weather. He has displayed fine qualities of airmanship, especially in a recent raid on Genoa, where his coolness and efficiency assisted materially in the success of the attack.

BAR TO DISTINGUISHED FLYING CROSS.

Sqn. Ldr. W. R. N. STURDY, D.F.C., No. 214 Sqn.—Since the award of his D.F.C. this officer has completed a number of daring sorties against the enemy. In July, 1942, when attacking a target in the Ruhr, his aircraft was severely damaged by anti-aircraft fire. With great presence of mind, Sqn. Ldr. Sturdy extinguished the fire which had started, and his great skill and coolness enabled him to fly his aircraft to base safely. In similar circumstances in September, 1942, he flew his aircraft back from Bremen—flying 400 miles on three engines. He has displayed great efficiency and courage in difficulties on several other occasions.

Flt. Lt. J. V. HOPGOOD, D.F.C., No. 106 Sqn.—This officer has completed many successful operations since being awarded the D.F.C. One night in August, 1942, he was detailed to bomb objectives at the port of Gdynia. This attack, which was pressed home with the greatest determination, achieved excellent results. On another occasion in October, 1942, during the daylight attack on Le Creusot, Flt. Lt. Hopgood participated in a particularly daring attack on the electrical transformer station, which was bombed effectively from a height of only 500 feet.

DISTINGUISHED FLYING CROSS.

Act. Sqn. Ldr. D. J. ISTED, No. 120 Sqn.—One day in December, 1942, Sqn. Ldr. Isted was captain of an aircraft detailed for a convoy escort flight. During the mission he was instrumental in making attacks on four U-boats. By his vigilance and determination he contributed materially to the safety of the convoy on that day.

Sqn. Ldr. D. L. G. DOUGLAS, R.A.A.F., No. 10 (R.A.A.F.) Sqn.—This flight commander has displayed devotion to duty, energy and tact to a high degree. These qualities, combined with an intimate knowledge of training, and operations in flying boats, have been largely responsible for the recent successes achieved by his squadron.

Act. Sqn. Ldr. C. O. BASTIAN, R.A.F.V.R., No. 7 Sqn.—This officer has made 27 operational sorties, many of them against the enemy's most heavily defended targets. Throughout he has shown himself to be a competent and reliable air gunner.

Act. Sqn. Ldr. P. C. ELLIOTT, No. 35 Sqn.—As captain of aircraft this officer has participated in a number of operational sorties. On one occasion following a successful attack his aircraft was forced down into the sea through shortage of petrol. On another occasion he successfully flew his aircraft home from the Ruhr on one engine.

Act. Sqn. Ldr. H. A. FORBES, R.C.A.F., No. 405 (R.C.A.F.) Sqn.—Sqn. Ldr. Forbes has a distinguished operational record. Accurate in all his planning, cool, calculating and efficient on operations, he has always shown fine qualities of courageous leadership.

Act. Sqn. Ldr. W. R. F. GRIERSON-JACKSON, R.C.A.F., No. 35 Sqn.—Sqn. Ldr. Grierson-Jackson has participated in many operational sorties, including two attacks upon the German naval base at Trondheim. His outstanding ability as navigator and the fine spirit and enthusiasm he has shown have contributed largely to the successes achieved.

Flt. Lt. D. W. CHAPMAN, R.A.F.V.R., No. 226 Sqn.—Flt. Lt. Chapman has served as gunnery leader since October, 1941. He has displayed fine leadership and, in every case of difficulty which has confronted his fellow gunners, he has unhesitatingly undertaken a similar type of mission to investigate the situation and contrive a remedy. For this purpose, on the occasion when Bremen was attacked by a thousand bombers, he flew as under gunner during supporting intruder operations.

Act. Sqn. Ldr. A. J. SAMSON, R.A.F.V.R., No. 218 Sqn.—For the last three months Sqn. Ldr. Samson has been employed as a flight commander. One night in July, 1942, he attacked Saarbrucken, despite intense anti-aircraft fire, and on another occasion in August he flew a very badly damaged aircraft safely back to base. One night in September, 1942, when approaching Munich his aircraft was caught in a cone of searchlights and subjected to very heavy fire from the ground defences. Nevertheless Sqn. Ldr. Samson proceeded and attacked his objective. On the return journey he was again heavily attacked by anti-aircraft fire, and the second pilot and flight engineer were wounded. Despite great difficulties, this officer flew his aircraft home and effected a forced landing without damage.

Act. Sqn. Ldr. T. L. SANDES, R.A.F.V.R., No. 115 Sqn.—This officer has taken part in many operational sorties over some of the enemy's most heavily defended targets. On one occasion when returning from Bremen he was attacked by an enemy night fighter. In the ensuing engagement the rear gunner was killed, the wireless operator and air bomber were wounded, and the aircraft received severe damage. Despite these handicaps

Flt. Lt A. D. Frecker, No. 252 Sqn., has been awarded the D.F.C. He has four enemy aircraft to his credit.

SERVICE AVIATION

Sqn. Ldr. Sandes skilfully flew his aircraft back to base and crash landed without further injury to his crew.

Flt. Lt. D. E. I. CLARK, R.A.F.V.R., No. 15 Sqn.—Flt. Lt. Clark as gunnery leader has completed numerous operational sorties in heavy bombers. On one occasion his aircraft was attacked by a Me 110. During the engagement which followed, the reflector sight failed, but Flt. Lt. Clark resourcefully overcame the difficulty by fixing a piece of chewing gum to the perspex of his turret. He then succeeded in driving off the attacking aircraft.

Flt. Lt. B. J. MCMASTER, R.A.F.V.R., No. 542 Sqn.—This officer has taken part in many sorties of a most varied nature. By his keenness he has set a great example to his fellow pilots.

Photographic Recos

Act. Flt. Lt. R. N. G. ALLEN, R.A.F.V.R., No. 128 Sqn.—Act. Flt. Lt Allen has been engaged in photographic reconnaissance duties for some time and has acquired great skill in these duties Despite accurate anti-aircraft fire and the efforts of enemy fighters he has never returned to his base without completing his task.

Act. Flt. Lt. A. F. BEECHEY, R.A.F.V.R., No. 101 Sqn.—This officer has completed many sorties in fighter aircraft and as an air gunner in heavy bombers. He has always displayed great skill and determination and since acting as gunnery leader he has set an inspiring example.

Act. Flt. Lt. W. A. O'Moore S. BRAYTON, R.A.F.V.R., No. 502 Sqn.—Flt. Lt. Brayton has displayed exceptional enthusiasm for his duties as a gunner His high standard of efficiency has been an inspiration to all and his personal example has been invaluable to his colleagues.

Act. Flt. Lt. P. R. GASKELL, R.A.F.V.R., No. 102 Sqn.—Flt. Lt. Gaskell is a captain of outstanding ability, who has taken part in many operational sorties over enemy territory. His exceptional fearlessness in the face of danger has inspired his crew with great confidence in his leadership.

Act. Flt. Lt. D. G. HEWLINGS, R.A.F.V.R., No 204 Sqn.—In October, 1942, Flt. Lt. Hewlings was detailed to proceed to the rescue of the crew of a crashed Wellington aircraft. Undeterred by heavy swell and surf, Flt. Lt. Hewlings brought his flying boat safely down on the sea and rescued the whole party in the dinghy, and conveyed them to safety.

Act. Flt. Lt. E. C. KENDALL, R.C.A.F., No. 407 (R.C.A.F.) Sqn.—Flt. Lt. Kendall has on many occasions navigated the leading aircraft of formations which have made successful attacks on enemy shipping. Since April, 1942, when he became bombing leader and squadron navigation officer, there have been 26 successful attacks on shipping, resulting in serious damage to, or the loss of, enemy merchant vessels.

Act Flt. Lt. B. L. KENYON, R.A.F.V.R., No. 419 (R.C.A.F.) Sqn.—This officer has taken part in many operational sorties, as rear gunner and front gunner/bomb aimer His aircraft has been engaged by enemy aircraft and fighter defences on numerous occasions, but the cool and calculated way he has directed evasive tactics has largely contributed to the safety of the aircraft and crew. On one occasion his crew was detailed to attack Warnemunde. This operation was undertaken successfully from a low level, but resulted in damage to the aircraft. On the return journey the aircraft was attacked by an enemy fighter and sustained further damage, and the rear gunner was wounded Flt Lt. Kenyon extricated the wounded gunner, rendered first aid and stationed himself in the astro-dome aperture, where he remained until the aircraft was landed.

Act. Flt Lt. J. E. MCCORMACK, R.C.A.F., No. 419 (R.C.A.F.) Sqn.—This officer has participated in numerous sorties, including the attacks on Cologne and Bremen when 1,000 of our bombers operated; he also took part in an attack on the Renault Works and Gennevilliers, near Paris.

Act. Flt. Lt. P. N. MCEVOY, No 35 Sqn.—As captain of aircraft Flt. Lt. McEvoy has taken part in a large number of operational sorties, the majority of which have been against the most heavily defended German targets.

Act. Flt. Lt. G. H. MALCOLM, R.A.F.V.R., No. 7 Sqn.—This officer has completed a number of operational sorties, many on well-defended and distant targets. By his ability to reach difficult objectives he has consistently shown himself to be an operational captain with determination to press home his attacks with courage of a high order.

Act. Flt. Lt. R. G. W. PLUTTE, R.A.F.V.R., No. 35 Sqn.—This captain of aircraft has completed many operational sorties on all the enemy's most heavily defended targets, displaying throughout the utmost determination to bring his mission to a successful conclusion regardless of the dangers to be faced.

BAR TO DISTINGUISHED FLYING MEDAL.

Sgt. G. P. LACE, D.F.M., No. 106 Sqn.—Since being awarded the D.F.M. in July, 1942, this captain of aircraft has participated in further operational sorties, including targets in the Ruhr and Italy, and several mining operations. On three occasions his aircraft has been attacked by hostile fighters, one of which was destroyed. Each time his aircraft sustained damage, and on the second occasion he flew it home on three engines. On another occasion, displaying great skill, he crash landed his aircraft, while still carrying a 4,000 lb. bomb, without injury to his crew.

DISTINGUISHED FLYING MEDAL.

Sgt. R. J. MCCOLL, No. 120 Sqn.

Sgt. G. W. TURNER, No. 120 Sqn.—For citation see Sqn. Ldr. Bulloch, D.S.O., D.F.C.

Flt. Sgt. W. L. COLLINS, R.A.F.V.R., No. 269 Sqn.—As navigator of an aircraft on many anti-submarine patrols, Flt. Sgt. Collins has accomplished outstanding work. During a period of six weeks he sighted five submarines and took part in four most determined attacks.

Flt. Sgt. F. N. CROUCH, R.A.A.F., No. 97 Sqn. —Flt. Sgt. Crouch as captain of aircraft has taken part in many operational missions, the majority of which have been against the heavily defended targets in the Ruhr and Western Germany.

Flt. Sgt. W. E. DUNHILL, A.A.F., No. 35 Sqn.—Flt. Sgt. Dunhill has continually evinced a spirit of efficiency and cheerfulness throughout the many sorties against the enemy in which he has participated. As air gunner, his thorough knowledge of his work, his skill, and unfailing eagerness for combat, have been an example to others.

Flt. Sgt. J. H. P. DWYER, R.A.F.V.R., No. 57 Sqn. (since reported missing).—As a rear gunner Flt. Sgt. Dwyer has participated in many operational sorties, including recent attacks on Le Creusot, Genoa and Milan. In June, 1941, he was injured during a raid on Kiel and was unable to participate in operational flying for approximately 10 months.

Flt Sgt. L. EDMUNDS, No. 150 Sqn.—This airman is employed as air gunner. He has always displayed high skill and courage, setting an example which has inspired his colleagues. On one occasion, whilst over Berlin, his aircraft was subjected to intense anti-aircraft fire. By his skilful and clear directions he enabled his pilot to evade the defences. On the return flight during a later sortie his aircraft crashed into a hill. Flt. Sgt. Edmunds was the only survivor. Although his back and arms were broken, he resumed operational flying after recovery. He is acting as flight gunnery leader.

Flt. Sgt. (now P/O.) W. J. FARRELLY, R.A.A.F., No. 50 Sqn.—Flt. Sgt. Farrelly took part in the highly successful attack on Lubeck and has also made attacks on many of the important targets in Germany. On all occasions he has shown himself to be a sound and reliable operational navigator. One night in September, 1942, he navigated his crew to Munich where an excellent photograph was obtained. In addition to his operational duties this airman has performed valuable work in both the station and squadron navigation sections.

High Standard

Flt. Sgt. B. T. FOXLEE, R.A.A.F., No. 50 Sqn.—This wireless operator/air gunner has taken part in attacks on most of the important industrial centres of Germany. He has always secured the maximum efficiency of his wireless equipment.

Flt. Sgt. (now P/O.) G. L. GOODALL, R.C.A.F., No. 15 Sqn.—Flt. Sgt. Goodall has taken part in many operational sorties. He has at all times shown a high standard of devotion to duty and great skill in his role of bomb-aimer.

Flt. Sgt. W. C. GRIMES, No. 218 Sqn.—This wireless operator/air gunner has taken part in many operational sorties. On July 14th, 1941, his aircraft was one of a formation detailed for a daylight raid on the German battleships in Brest harbour. When attacked by two enemy fighters the combined fire from the bomber drove off one of the enemy fighters and destroyed the other. In September, 1942, following an attack on Munich, the aircraft, in which Flt. Sgt. Grimes was flying, was hit by intense anti-aircraft fire, and the second pilot and engineer received wounds. Flt. Sgt. Grimes rendered first aid to his comrades, and by his skilful directions assisted his captain to fly the damaged aircraft safely back to this country.

Flt. Sgt. D. HAMILTON, R.A.F.V.R., No. 106 Sqn.—This airman, in the course of operational sorties, has attacked many important industrial targets in Germany, including Cologne, where he achieved outstanding success. He participated in the daylight raids on Le Creusot and Milan, displaying a high degree of skill and efficiency. A mission to Genoa, in October, was also marked by special courage and coolness, when one of his engines failed, and he completed the return journey over the Alps successfully on three engines.

Flt. Sgt. (now P/O.) L. A. HAYWARD, R.A.A.F., No. 58 Sqn.—One day in June, 1942, while flying as captain of a Whitley aircraft, on anti-submarine patrol, Flt. Sgt. Hayward participated in an attack on a U-boat, in the course of which his aircraft sustained serious damage. Only the extreme coolness and skill displayed by the pilot prevented the aircraft from diving into the sea. His prompt and efficient action enabled the crew to reach land, where a crash-landing was made.

Tireless Efforts

Flt. Sgt. (now P/O.) J. D. M. HERRON, R.N.Z.A.F., No. 207 Sqn. (since reported missing). Flt. Sgt. Herron, as captain of aircraft, has always shown outstanding courage and determination on operations. He has displayed an extremely high sense of duty, and his tireless efforts to maintain that very high standard during a most exacting time have been an inspiration to the rest of his squadron.

Flt. Sgt. H. A. W. JOLLY, No. 35 Sqn.—During an exceptionally large number of operational flights against enemy targets, as wireless operator/air gunner, Flt. Sgt. Jolly has given evidence of great skill and determination.

Flt. Sgt. S. E. J. JONES, R.A.F.V.R., No. 106 Sqn.—As captain of aircraft, Flt. Sgt. Jones has always displayed the greatest courage and skill during many attacks on enemy targets. He has participated in many raids on industrial areas in Germany and on enemy naval ports.

Flt. Sgt. C. LEATHEM, No. 7 Sqn.—As rear gunner, Flt. Sgt. Leathem has completed a large number of operational sorties, many of them against the most heavily defended targets in Germany. In the course of these operations, he has probably shot down one enemy fighter and damaged another.

Flt. Sgt. L. LEDGER, R.A.F.V.R., No. 35 Sqn.—Acting as air gunner, Flt. Sgt. Ledger has taken part in many operational sorties, and has completed the missions upon which he has been detailed with unfailing reliability and determination.

Flt. Sgt. H. B. F. LYMNA, No. 35 Sqn.—Flt. Sgt. Lymna has given evidence of steadfast skill and courage while flying as navigator on many sorties against enemy targets. On one occasion, after a successful attack on Cologne, he displayed commendable coolness, when his aircraft was damaged by anti-aircraft fire, and three members of the crew seriously wounded. After assisting the injured, he successfully navigated the damaged aircraft back to this country.

Flt. Sgt. J. M MEAGHER, R.C.A.F., No. 158 Sqn.—As wireless operator and air-bomber, this airman has participated in numerous sorties, including several attacks on Essen. His wireless skill has been invaluable. His success as an air-bomber has been achieved by untiring efforts and dogged determination to ensure that his bombs

U.S. ARMY AIR FORCE DINGHY: The kite suspends a radio aerial for sending S.O.S. signals and there is also a rubberised sheet for catching rain-water.

were dropped on the enemy with the most destructive effect.

Flt. Sgt. T. OAKES, No. 83 Sqn.—One night in June, 1942, Flt. Sgt. Oakes was detailed to act as flight engineer on an operational sortie. On the return journey extremely bad weather was encountered, and the captain, taken ill suddenly, was unable to control the aircraft. Though he had never flown that type of aircraft before, Flt. Sgt. Oakes, without the slightest hesitation, took over the controls and piloted it safely back to base. On another occasion, in September, 1942, he was detailed to attack a target in the Ruhr. Despite fire from intensely heavy ground defences, this airman pressed home his attack with the utmost determination and secured an excellent photograph.

Flt. Sgt. W. O'KANE, No. 35 Sqn.—Flt. Sgt. O'Kane, as flight engineer leader of his squadron, has taken part in a large number of sorties against targets in enemy territory, and has, by his tenacity and skill, contributed largely to the successes attained.

Flt. Sgt. J. W. OLDHAM, No. 142 Sqn.—In the role of air observer, Flt. Sgt. Oldham has successfully completed numerous operational sorties over enemy territory. One night in August, 1942, he was navigator of an aircraft which was subjected to intense anti-aircraft fire when over the Ruhr, and forced off its intended track. Showing a high degree of skill, this airman successfully navigated his damaged aircraft back to this country.

Three Over 1,000 Raids

Flt. Sgt. (now Act. W/O.) C. A. SHIRLEY, R.C.A.F., No. 50 Sqn.—Flt. Sgt. Shirley, as navigator, has participated in many attacks on important targets in the Ruhr and the Rhineland. He also took part in two of the attacks on Rostock and all three "1,000 bomber" raids on Cologne, the Ruhr and Bremen, and the highly successful attacks on Genoa and the daylight raid on Milan.

Flt. Sgt. G. E. WOODCOCK, R.A.F.V.R., No. 235 Sqn.—In September, 1942, this airman was pilot of an aircraft taking part in a sweep over the Bay of Biscay when one Fw 200 and two Ju 88s were destroyed. Throughout his service with the squadron, this airman has displayed splendid powers of determination and efficiency, in reconnaissance flights, offensive patrols and air/sea-rescue searches.

Flt. Sgt. D. W. WOOLLEY, No. 106 Sqn.—As navigator, Flt. Sgt. Woolley has consistently displayed the highest navigational skill. At all times he has shown courage and endurance in locating the most difficult targets in adverse weather conditions. He has navigated successfully to many targets in the Ruhr and North-Western Germany, and also to Turin and Genoa. In addition, he participated in the daylight raids on Le Creusot and Milan. On one occasion he took part in a mine-laying expedition, and was in the air for no less than 12 hours.

Sgt. G. A. BERWICK, No. 138 Sqn.—This flight engineer has participated in many long-range operational sorties. His pioneer work has developed the basis upon which his fellow-engineers are now instructed.

Sgt. T. CLARKE, No. 115 Sqn.—This air gunner has shown great courage in the face of many adversities. On several occasions Sgt. Clarke has driven off enemy fighters by the skilful use of his guns, and has thereby contributed much to the safe return of his aircraft.

Sgt. G. R. DAVIDSON.—Sgt. Davidson is a wireless operator of great ability. He has taken part in attacks on a wide range of targets in heavily defended areas, such as Bremen, Cologne, Kiel, Hamburg and Essen.

Sgt. A. ELLIOT, No. 142 Sqn.—Sgt. Elliot, as a wireless operator, has completed numerous successful operations over enemy territory. On one occasion, in August, 1942, whilst over the Ruhr, his aircraft was hit by anti-aircraft fire, which caused the incendiaries to catch fire and severely damaged the starboard engine controls. The safe return of the aircraft to this country was greatly assisted by the coolness and technical skill displayed by this airman.

Sgt. A. W. FISH, No. 7 Sqn.—Sgt. Fish has completed a large number of operational sorties against enemy territory. His high standard of professional efficiency as flight engineer has, on occasions, been largely responsible for the safe return of his aircraft after it had received severe damage by enemy action.

Sgt. C. FISHER, R.C.A.F., No. 420 Sqn.—This airman has carried out his navigational tasks with skill and determination, and his ability, combined with his determination in attack, has contributed materially to the successes achieved. In addition to his many bombing sorties, Sgt. Fisher has participated in numerous mine-laying operations.

(B.E.M. Mil.)

Flt. Sgt. J. PHILP, No. 149 Sqn.
Sgt. G. K. REARDON, R.C.A.F., No. 149 Sqn.
Sgt. L. V. FOSSLEITNER, No. 149 Sqn.

Flt. Sgt. Philp and Sgts Reardon and Fossleitner were captain, front gunner and navigator respectively of an aircraft which attacked Munich one night in September, 1942. On the return flight the engineer reported that there would be sufficient spare fuel to operate for only 15 minutes on arrival at base. Flt. Sgt. Philp therefore obtained permission to land at a nearer airfield. When nearing the airfields, however, one of the engines failed, and it was necessary to descend on to the sea off the coast. Although the aircraft was kept level it broke in four parts on impact with the water and these three airmen, together with the wireless operator and the mid-upper gunner, were thrown into the sea. Flt. Sgt. Philp, who is a strong swimmer, volunteered to swim to shore alone to get help. He abandoned this intention, however, as it was necessary to help the mid-upper gunner, and he and Sgt. Reardon started to swim ashore, taking the mid-upper gunner with them. They were picked up by a fishing boat after swimming for 3½ hours, but unfortunately the gunner was found to be dead. In the meantime Sgt. Fossleitner, although badly shaken, had volunteered to remain behind on one of the wings and support the wireless operator, whose spine was fractured. He supported him for 2½ hours until eventually both were picked up by an Air/Sea Rescue Launch.

Cpl. S. BANKS.—Cpl. Banks was second coxswain on a high speed launch on August 19th, 1942. He showed great coolness under fire, and after the crew abandoned ship he swam around encouraging them, and on at least two occasions inflated the life jackets of members of the crew who were too exhausted to help themselves.

Air Chief Marshal Sir Arthur Tedder, Vice Chief of Air Staff (second from left) leaves for a visit to Algeria with Maj. Gen. Lewis Brereton (third from left) and A'r Comdre. L. O. Brown (extreme left).

Roll of Honour

Casualty Communiqué No. 196.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. F. G. Beale; Flt. Lt. K. M. Miller; Sgt. A. M. Nott; Sgt. J. Richardson; Flt. Sgt. C. R. Speakman; Flt. Sgt. W. M. Tansley; P/O. D. B. Todd.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Act. Sqn. Ldr. H. J. V. Ashworth; Sgt. A. R. Moore; Sgt. F. Walker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. T. Barrett; Sgt. H. A. B. Bird; P/O. G. R. Bland; Sgt. G. V. Brennan; F/O. D. G. Carter; Sgt. G. W. Carter; Sgt. T. K. Carter; Sgt. W. Clezy; Sgt. H. S. G. Cullen; Sgt. C. W. Davey; P/O. H. F. Deck; P/O. F. H. Down; Flt. Sgt. D. Driscoll; Flt. Sgt. S. Duckworth; Sgt. O. R. Durston; Sgt. C. O. Forrester; Sgt. E. C. Groves; Sgt. E. F. E. Hodges; Sqn. Ldr. J. A. Kitchin; Sgt. W. A. Lea; Act. Sqn. Ldr. J. P. V. Nicholls; Flt. Sgt. D. E. T. Owen; Sgt. L. E. B. Oxley; Sgt. F. A. Robinson; P/O. M. L. Simon; Sgt. A. W. Smith; Sgt. L. C. Stanley; P/O. J. N. Tillard; Sgt. M. V. Ward; Sgt. A. F. Trawford; Flt. Sgt. T. Watson; Sgt. N. H. Webster; Sgt. T. W. Weeks; Sgt. D. J. White; Sgt. R. P. Williams; Act. Flt. Lt. C. P. J. Wood, D.F.C.; P/O. R. S. Woolass.

WOUNDED OR INJURED IN ACTION.—P/O. E. Brown; Sgt. A. N. Ellis.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. T. Allen; Flt. Lt. F. G. Baker; Sgt. A. G. Davis; Act. Flt. Lt. C. W. M. Pewell; Wing Cdr. H. M. Styles, D.S.O.

MISSING.—P/O. R. D. Ambrose; Act. Flt. Lt. r. C Attenborough; Sgt. T. F. Bailey; Sgt. R. E. Bates; Sgt. B. A. Beeney; P/O. A. V. J. Bettridge; Sgt. A. Brown; Sgt. E. Cheetham; Sgt. C. L. Cockburn; Sgt. G. A. F. Couzens; Sgt. T. Elder; P/O. R. H. D. Eshelby; Sgt. L. Fitzsimmons; P/O. C. G. Fox; Act. Sqn. Ldr. S. H. Fox, D.F.M.; F/O. D. Fulford, D.F.C.; Sgt. A. F. Gardner; F/O. M. G. Grant; Sgt. F. C. Hall; Sgt. A. Hallewell; Sgt. P. C. Heath; Sgt. G. C. J. Heywood; Sgt. D. H. Jenkins; P/O. A. W. Lawrence; Sgt. R. E Luckock; P/O. J. S. Martin; Flt. Sgt. N. A. Mercer; Sgt. E. Marsden; Sgt. R. A. S. Mitchell; Sgt. R. G. Mocheridge; Sgt. F. Morrison; Sgt. G. A. F. Pamenter; Sgt. S. V. Price; P/O. W. F. Raffan; P/O. W. Rogers; Sgt. W. J. Salter; Act. Flt. Lt. T. A. D. Sassoon; Flt. Sgt. C. Smith; Sgt. V. R. Spear; W/O. H. J. Spiller, D.F.M.; P/O. R. A. Studd, A.F.C.; Sgt. K. J. Thorne; P/O. H. J. Turner; P/O. J. E. Turnham; Sgt. H. W. Ward; Sgt. H. H. Warren; P/O L. Wheatley; Act. Sgt. S. White; Sgt. H. F. Wood; P/O. L. R. Youngman.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. G. S. Rennie.

KILLED ON ACTIVE SERVICE.—Sgt. J. R. R. Allison; Sgt. H. Bailey; Sgt. N. G. Deal; Flt. Sgt. N. Birch; Sgt. A. S. E. Blackshire; Flt. Lt. R. T. Bradshaw; Sgt. A. N. Brown; Sgt. M. O. Brown; Sgt. H. W. Carter; P/O L. P. Coupland; Sgt. L. Cousins; Flt. Lt. M. I. Dore; Sgt. F. J. Faye; Act. Flt. Lt. F. N. Gillit; L.A/C. T. F. Holland; P/O. A. A. Horvath; Act. Flt. Lt. J. MacN. Kellas; Act. Wing Cdr. C. F. King; Sgt. J. M. Lennox; Sgt. D A. Macdonald; Flt. Sgt. T. H. Martin; Sgt. K. Milburn; Sgt. H. P. Painting; Flt. Sgt. J. F. Palmer; W/O. N. W. Robins; L.A/C. E. O. Scale; Sgt. D. Thunfield; Sgt. W. E. Trumper; Sgt. J. W. Wilde.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Act. Sgt. E. D. Barrett.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. H. Bester; Sgt. J. T. Bogg; P/O. A. Burnie; Sgt. A. E. Geers; Sgt. J. Gray; Sgt. J. Oldknow; Sgt. G. W. Searle.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—P/O. F. E. Hancock; F/O. J. D. B. Rigby; Sgt. B. F. C. Rixon.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. W. Donald; Cpl. P. Ebsworth-Donkin; A/C.2 R. H. Knowles; Sgt. W. MacLeod; F/O. D. Newell; Sgt. A. E. Read; A/C 2 J. W. T. Skinner; Sgt. T. H. Stanley.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. D. Francis; L.A/C. C. W. F. Ironmonge; P/O. W. W Martindale; Flt. Lt. P. A. Mortimer.

DIED ON ACTIVE SERVICE.—Cpl. E. W. Ashfield; A/C.1 E. J. Bone; A/C.2 H. Bramham; Cpl. F. Bright; A/C.2 I. D. Crockett; A/C.1 F. Dwyer; A/C.2 A. C. Emery; A/C.1 A. H. Farrell; Flt. Sgt. R. W. Feyers; A/C.2 K. F. Fowler; Sgt. S. W. Fry; A/C.1 J. C. Hobbs; A/C.1 C. D. Holman; L.A/C. J. W. D. Milnes; Act. Wing Cdr. W. C. Mitchell; L.A/C. F. F. Packard; A/C.2 J. Sadler; W/O L. M. Saxby; L.A/C. A. Torrance; L.A/C. W. Trepp; L.A/C. G. T. Young.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. N. C. Beck; Sgt. H. B Reid; Sgt. W. I. Wallis.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. H. L. Croydon; Sgt. J. G. Edwards; Sgt. K. H. Eklund; P/O. J. C. MacDonald; P/O. J. W. Vickers.

SERVICE AVIATION

WOUNDED OR INJURED IN ACTION.—Sgt. H. L. Graves; Sgt. J. A. Robertson.

MISSING.—Sgt. A. R. G. Hart; Sgt. J. S. Holder; Sgt. D. H. Lee; Sgt. L. M. McCormack; P/O. D. L. McGregor; Sgt. B. O. K. McRoberts; Sgt. R. R. Mayze; Sgt. G. J. Officer; P/O. H. Steward; P/O. F. W. Wall.

KILLED ON ACTIVE SERVICE.—P/O. F. V. Browne; Sgt. C. S. Thomson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. Field.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. G. Matthams; P/O. L. C. Pyke.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. N. F. D. Simpson.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. J. N. Godfrey; Sgt. E. W. MacDonald; Sgt. F. T. Sabourin; P/O. J. J. Silcox.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. M. Hicks; Flt. Sgt. J. R. Brennan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. Lennox; Sgt. W. M. Pipher; P/O. J. H. Thomson.

WOUNDED OR INJURED IN ACTION.—Sgt. A. J. Tysowski.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. S. H. Spallin; Sgt. W. Thirde.

MISSING.—P/O. G. Cherniuk; Sgt. W. D. McL. Embree; P/O. D. R. Gill, Flt. Sgt. W. S. Howie; Sgt. W. K. Martin; Sgt. W. McK. Martin; Sgt. J. D. Maxwell; Flt. Sgt. J. R. O'Leary; Sgt. C. C. Shook; Sgt. E. R. Springham; Sgt. M. B. Valette.

KILLED ON ACTIVE SERVICE.—Sgt. G. G. Belec; P/O. C. G. Cann; Flt. Sgt. J. W. Forster; Sgt. L. E. L. Huddleston; Sgt. G. H. Neate; F/O. D. K. Robertson; Sgt. W. E. Whittingham; F/O. R. O. Worthington.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. A. Maier.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. E. H. Barrett; Sgt. D. F. Page.

DIED ON ACTIVE SERVICE.—Sgt. B. R. Yorke.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. P. J. Farren; Sgt. P. S. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. L. L. Harrison; Sgt. C. R. Spence; P/O. O. W. Suckling.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. S. Oldridge.

MISSING.—Flt. Sgt. T. L. Bowker; Sgt. R. L. A. McFarland; Flt. Sgt. D. J. Tottman; P/O. P. C. Whitwell, D.F.M.; Sgt. K. H. Yeoman.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Major R. H. Aitchinson.

MISSING.—Lt. D. R. G. Bailey; 2/Lt. D. C. James; 2/Lt. J. R. R. Pryde; 2/Lt. I. D. Sparg; 2/Lt. J. J. Steyn.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Lt. B. A. Dyer.

Casualty Communique No. 197.

Royal Air Force

KILLED IN ACTION.—Sgt. K. T. J. Adams; Sgt. E. Anthony; Sgt. A. R. Billington; Sgt. J. W. Bowes; Sgt. C. F. Clark; Sgt. N. Curd; Sgt. L. G. F. Gravett; Sgt. T. S. Gregory; P/O. G. C. Griffin; Sqn. Ldr. D. J. Hamilton; Flt. Sgt. E. A. Howard; Sgt. J. Osborn; Sgt. R. C. Perchard; F/O. H. J. Phillips; Sgt. R. H. Stevens; Sgt. J. J. Taaffe; Flt. Lt. G. T. Turner; Sgt. R. E. Werren; Sgt. D. J. Wicks; Sgt. H. R. Willacy; F/O. E. A. J. Williams.

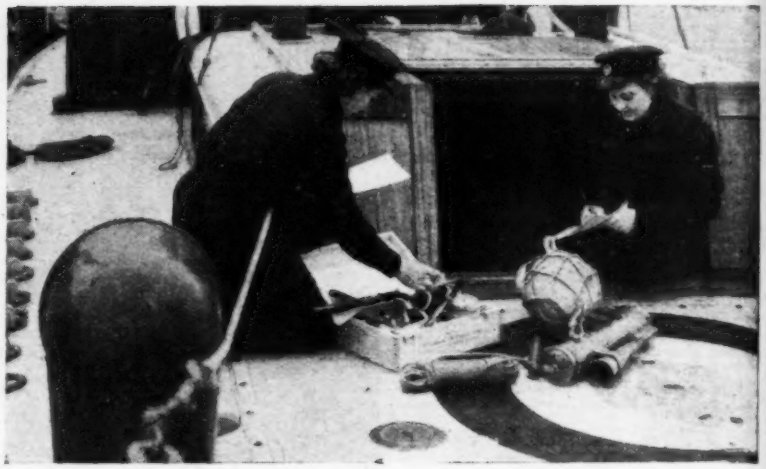
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. A. Eyers.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. Adamson, D.F.M.; Sgt. C. Brown; P/O. J. McK. Cassavetti; Flt. Sgt. J. A. Chamberlain; P/O. C. S. Churchill; Sgt. R. Dawson; Sgt. H. Dracass; Flt. Lt. A. J. H. Finch; Sgt. H. J. Hickman; Sgt. R. F. Howell; Sgt. D. A. B. Hume; Sgt. R. W. G. Kent; Sgt. J. Mitchell; Sgt. J. W. Robinson; P/O. R. P. Runagall; Sgt. S. W. Stevenson; Flt. Sgt. F. MacI. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. I. Rutherford.

WOUNDED OR INJURED IN ACTION.—Sgt. S. J. Durden; Sgt. C. M. Edgehill; Sgt. L. Purchase; Sgt. W. Sercombe.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. J. Atkinson; P/O. H. Bardsley; Flt. Sgt. G. Green; Sgt. E. T. Jones; Sgt. R. Leese; Sgt. T. McL. Millar; Sgt. J. B. Ritchie; Flt. Sgt. R. G. Rowe; P/O. E. J. Sleigh; Sgt. P. Whelan.



LOGS, PATENT, EXCELSIOR MK IV: W.A.A.F. personnel of the Air/Sea Rescue service check the inventory of a new boat going into commission.

MISSING.—P/O. G. E. Andrews; Sgt. W. A. H. Ball; P/O. W. G. Barrett; Sgt. A. J. A. Bartle; Sgt. D. B. Beales; Sgt. R. H. G. Bowkett; Sgt. J. C. Brookes; Sgt. W. J. Brown; Sgt. L. A. Buckthorpe; Sgt. S. J. Butcher; Sgt. J. P. Canavan; Sgt. J. P. Carter; Sgt. W. G. Chapman; Flt. Sgt. A. W. Coley; Sgt. J. Cope; Sgt. L. A. Davies; Sgt. D. H. Davison; Sgt. R. H. Drew; Flt. Sgt. J. H. P. Dwyer; Sgt. L. Edwards; Sgt. F. J. Frayne; Sgt. D. G. Gage; Sgt. R. W. Grellier; P/O. W. W. Griffin; P/O. T. G. Hackney; Sgt. P. Hayward; P/O. O. M. Hedley; Sgt. F. Henfrey; Sgt. L. Hodgson; P/O. R. W. Hooper; Sgt. W. J. Jarvis; P/O. B. A. Kirkham; Sgt. K. G. Lambert; Flt. Sgt. W. J. Lovejoy; Sgt. R. T. Luepke; Sgt. C. E. Lyon; Sgt. J. McGauchie; Sgt. E. MacKay; P/O. P. B. Nanton; Flt. Lt. W. Nicholls, D.F.C.; Flt. Sgt. J. H. Pellowe; Sgt. A. J. Perrin; F/O. A. E. K. Perry; P/O. F. Rawle; Flt. Sgt. W. J. Rose; Sgt. E. H. Seares; Flt. Sgt. L. Smith; P/O. L. G. O. Smith; Sgt. W. A. Smith; Sgt. T. A. Keech; Act. Sqn. Ldr. P. D. C. Thomas, D.F.C.; Sgt. J. L. G. Waite; Sgt. J. W. A. Walker; Sgt. R. Walker; P/O. M. E. Walsh, D.F.C.; Sgt. J. M. Watt; P/O. G. A. R. Welsford; Sgt. H. Wigley; Sgt. J. B. Williams; P/O. R. S. Wilson; Sgt. D. F. Wolf.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. J. Sutton.

KILLED ON ACTIVE SERVICE.—Act. Flt. Lt. W. A. M. Birt, A.F.C.; Sgt. D. C. Bryant; Sgt. H. E. Busby; A/C.1 T. E. Clarke; P/O. J. D. Crabbe; P/O. D. Davies; Sgt. H. Dickenson; Sgt. C. E. Evans; Sgt. R. A. N. St. J. Farnon; Sgt. G. O. Forrester; F/O. J. H. Fuller; Sgt. R. C. Gibson; P/O. E. A. B. Gordon; P/O. E. Greaves; Sgt. J. Greenall; Sgt. G. H. Gregg; Sgt. M. H. Griffith; L.A/C. A. S. Guild; Sgt. W. Hall; Flt. Sgt. T. G. Irvine; P/O. D. I. Jones; F/O. H. G. Kallend; Flt. Lt. G. J. Le Mar; Sgt. T. J. McCloud; A/C.1 T. V. Plummer; Sgt. C. K. St. John; Flt. Sgt. J. F. Saunders; P/O. E. O. Shardlow; Sgt. H. E. Shaw; Sgt. L. F. K. Spratt; W/O. G. J. Stock; Flt. Sgt. C. Stradling; L.A/C. J. F. Swain; A/C.1 J. Sykes; Sgt. A. W. Taney; Sgt. W. D. Thomas; Sgt. S. A. Veasey; F/O. W. T. E. Voller; L.A/C. V. H. Wright; L.A/C. F. A. Zinke.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. W. J. P. Olney.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. H. Lamond.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. J. F. Gates; F/O. W. R. Mummery; Sgt. E. T. Owen; A/C.2 M. Roberts; Sgt. G. H. Wheatland.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. H. C. N. Adams; Flt. Sgt. D. P. Gooby.

DIED ON ACTIVE SERVICE.—A/C.1 T. H. Bird; Cpl. H. B. Bishop; Cpl. D. A. R. Brookes; A/C.2 A. H. T. Clements; Flt. Lt. A. N. David; Cpl. W. F. Ham; Cpl. W. F. Hibbard; P/O. R. G. Norman; Cpl. A. H. Nutley; Sgt. R. E. E. Vickery; A/C.1 J. W. Whitelaw.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. J. Campbell.

Royal Australian Air Force

KILLED IN ACTION.—P/O. D. F. Rowe.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. Parker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. P. F. Matthews.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. M. W. Shapir.

MISSING.—Sgt. H. P. S. Annells; Sgt. C. M. Chenoweth; Sgt. J. H. Lovell; Flt. Sgt. A. C. Maclure; Flt. Sgt. L. S. Middleton; Sgt. L. H. Morton; Flt. Sgt. A. J. Newman; Sgt. T. G. Richards.

KILLED ON ACTIVE SERVICE.—P/O. R. L. P. Browne.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. P. W. Northway; Sgt. W. R. Thompson.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. D. L. Grimes; P/O. H. L. Humphries; Sgt. D. D. Low; Flt. Sgt. A. J. McDonald; F/O. K. A. Mackenzie; P/O. A. L. Rebman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. L. G. Hosea; P/O. J. M. Runner; P/O. J. G. Scott.

WOUNDED OR INJURED IN ACTION.—Sgt. L. G. Masterson; Sgt. J. G. Mills.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. L. Buchanan; Sgt. A. G. Cumming; P/O. R. H. Foote; Flt. Sgt. V. R. Henry; Sgt. J. L. R. Keouch.

MISSING.—Flt. Lt. C. A. Brennan; P/O. A. B. Burgess; Sgt. N. A. Gardner; Flt. Sgt. W. F. Gordon; Sgt. E. J. Hald; Sgt. G. W. Harttung; P/O. F. G. James; Sgt. E. C. Kehl; Act. Flt. Lt. R. C. Lawrence; W/O. V. R. Long; P/O. D. R. Manley; P/O. W. H. Mathews, D.F.C.; P/O. A. D. Melville; P/O. B. J. Moffatt; Flt. Lt. D. R. Morrison, D.F.M.; Sgt. R. C. Mutch; P/O. R. W. Neill; Sgt. W. W. Peck; P/O. V. B. Ray; Flt. Sgt. M. L. Roberts; Sgt. E. B. Skuce; Sgt. R. P. Strain; P/O. G. P. Wilson; Sgt. F. E. Wise.

KILLED ON ACTIVE SERVICE.—Sgt. D. G. Barnie; Sgt. G. E. Booth; Sgt. D. Gordon-Kay; Sgt. C. R. Hasekian; Sgt. G. K. Shaw.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. W. O. Krueger.

Royal New Zealand Air Force

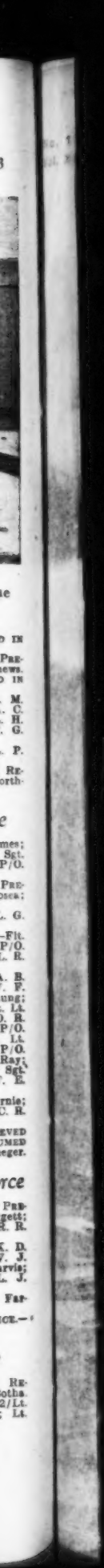
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. A. G. Huggett; Sgt. A. W. Kerrisk; P/O. I. S. Stone; Sgt. R. R. Thomas.

MISSING.—Sgt. J. M. Burgess; Flt. Sgt. K. D. Chapman; Flt. Sgt. C. A. Foster; Sgt. W. J. Hannah; Sgt. G. M. D. Hyde; Sgt. A. W. Jarvis; Sgt. R. O'Neill; Sgt. S. C. Orme; Sgt. L. J. Pearce.

KILLED ON ACTIVE SERVICE.—Sgt. H. W. Farquharson; Sgt. A. C. Smart.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. P. Hanna.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Capt. L. C. Botha.

MISSING.—Air Sgt. B. S. Clutterbuck; 2/Lt. W. B. Dalgleish; Air Sgt. S. C. Orme; Sgt. L. J. T. A. Simpson; Lt. M. H. T. Smuts.